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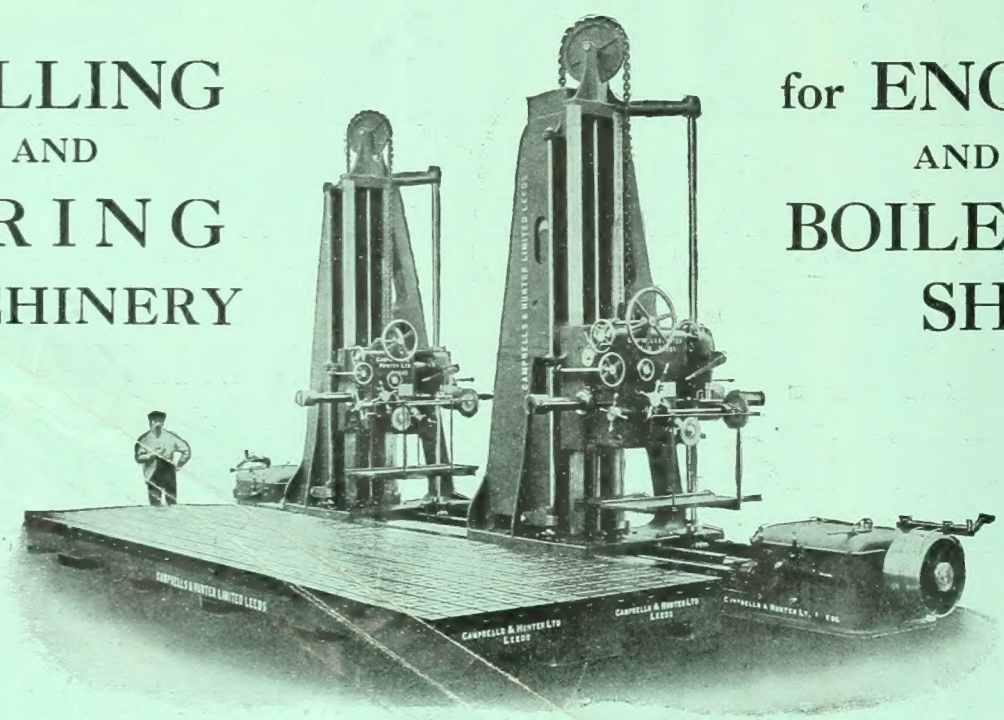

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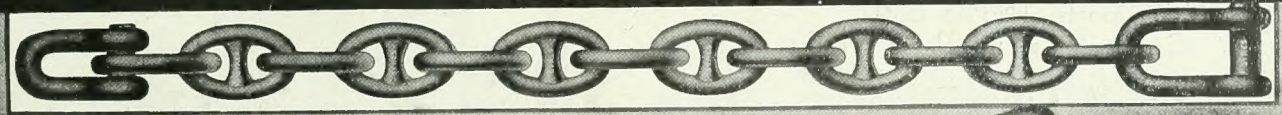

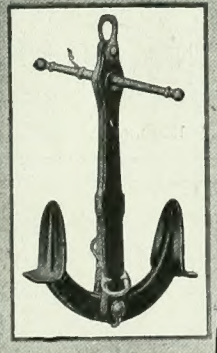

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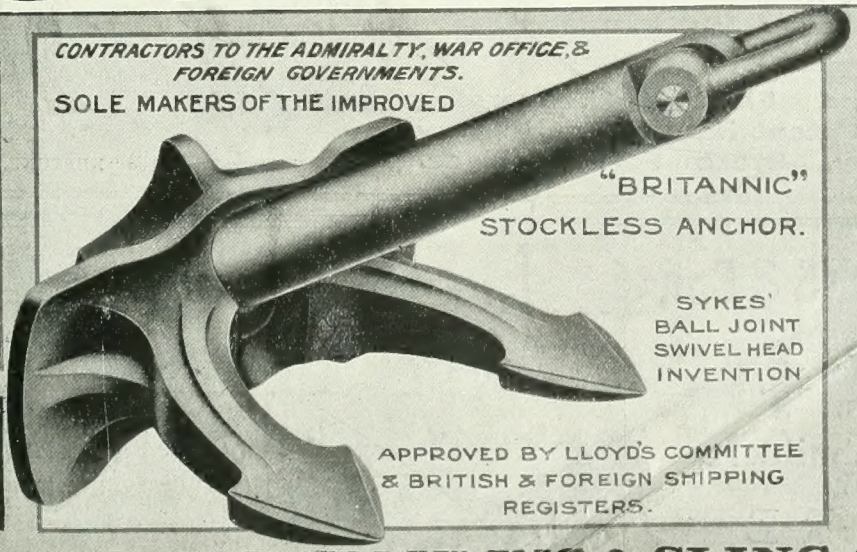

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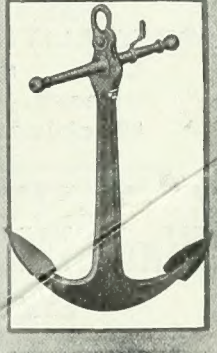

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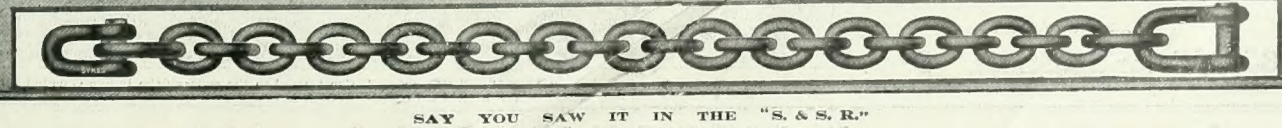

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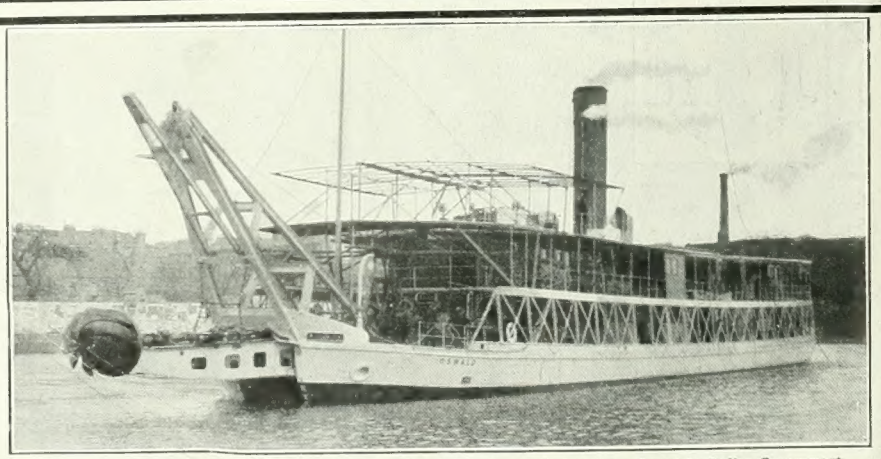

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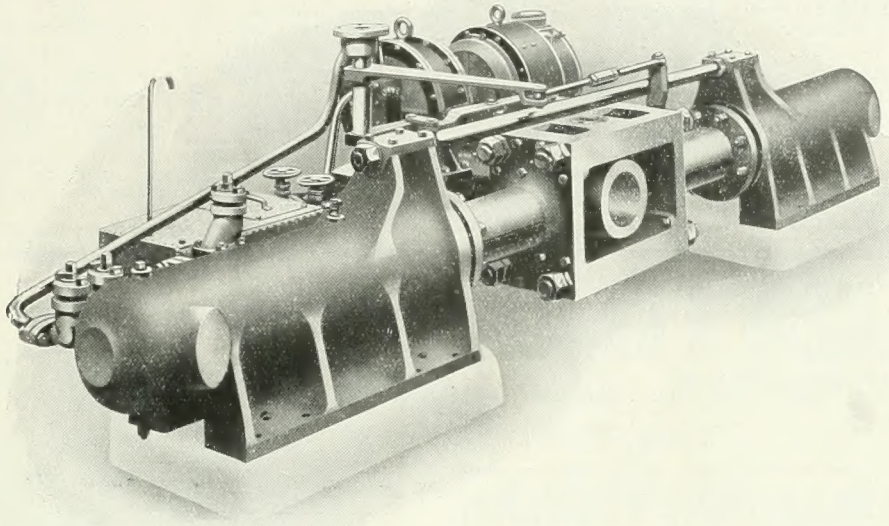

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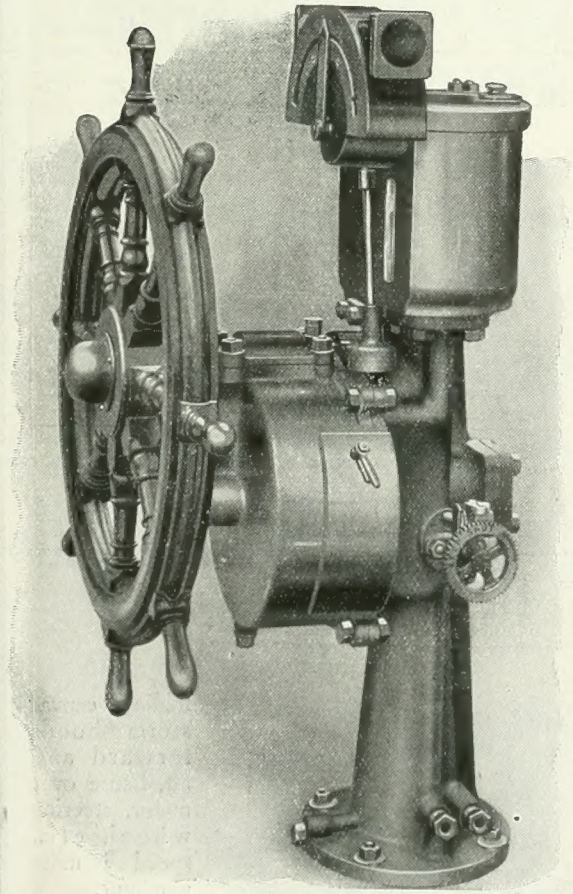

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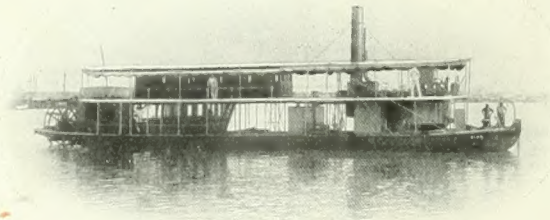

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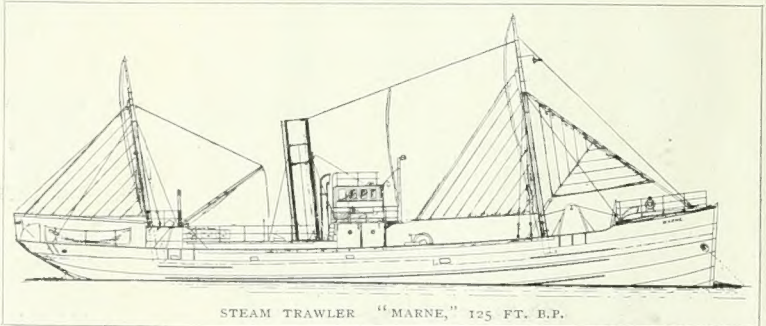

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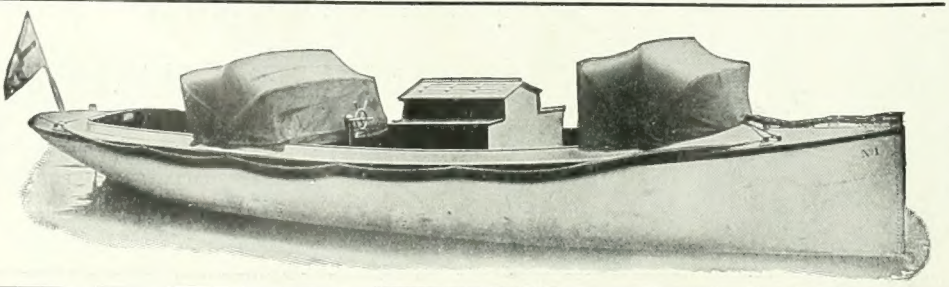

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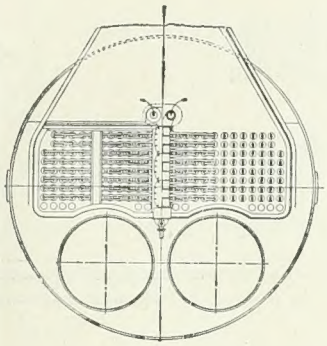

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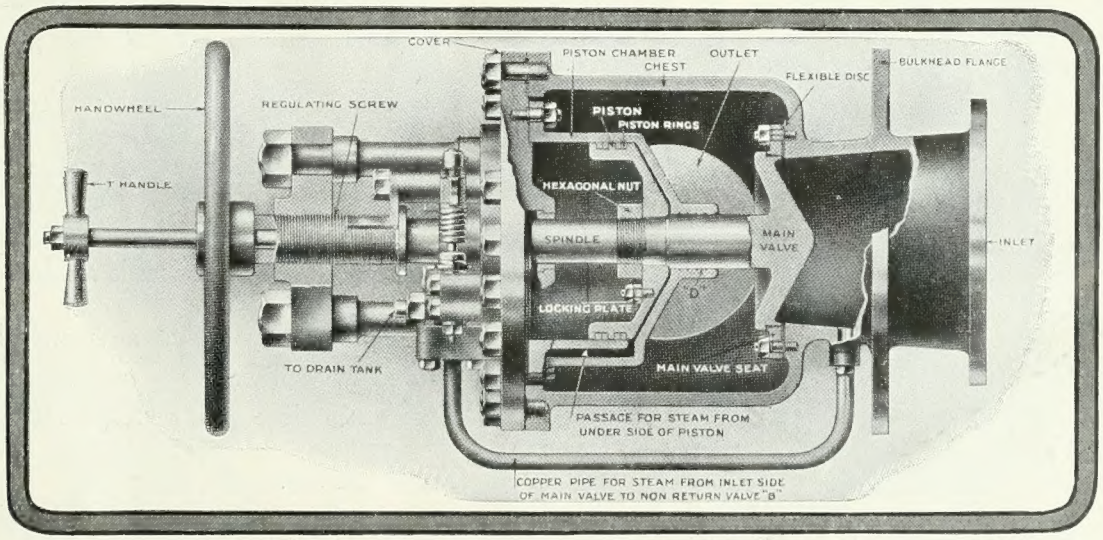

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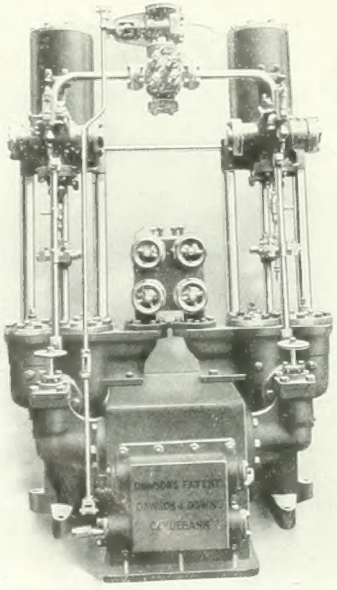

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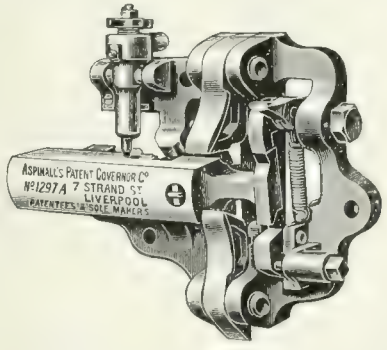

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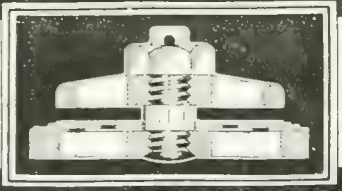

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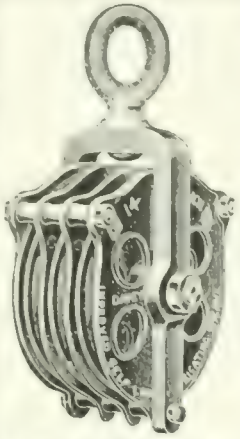

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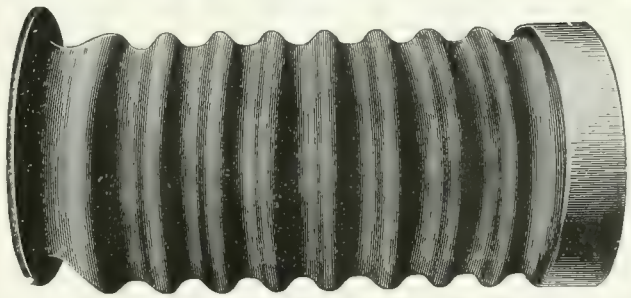

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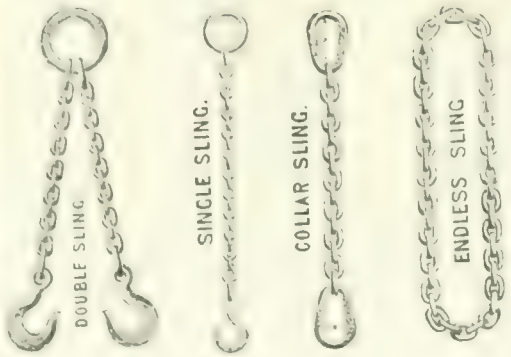

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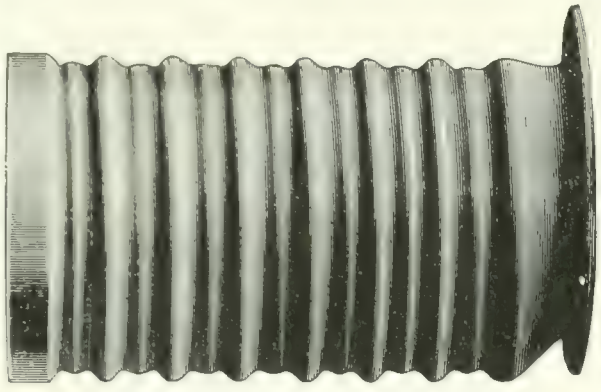

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Vol. VI. Thursday, November 18, 1915. No. 21.

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MR. CHURCHILL leaves the Cabinet for military service in the field. Before he enters on those duties he has taken an opportunity to defend his conduct in regard to certain enterprises which were undertaken while he was First Lord of the Admiralty. His narrative shows that, contrary to the suspicions which have perturbed some people, Mr. Churchill fully consulted his professional advisers and Cabinet colleagues and obtained their assent before events involving great issues of policy were entered on. The Antwerp expedition was the resolve of the Cabinet. The possibilities of success in the Dardanelles were examined by the experts and the undertaking received a large amount of naval support. The one criticism that occurs to us is that the military and naval shares in it were not more nearly synchronised and co-ordinated. From that defect have flowed many troubles. We note that Mr. Churchill says that Lord Fisher did not express any opinion against the naval bombardment. He goes on to observe that he did not receive from the then First Sea Lord the clear guidance before the event or the firm support afterwards which he was entitled to expect. Controversies between two men of commanding personalties in their respective posts are painful subjects. As Mr. Churchill has now laid down the Cabinet office which he has held since he left the Admiralty, the occasion is appropriate to put on record his priceless services to the State, first during the years in which he was bringing the Navy into a state of preparedness, and secondly with the prompt and efficient way in which the fleet took up its war stations in the fateful days of August, 1914. We do not lay down that occasional imprudences may not have marked his career at the Admiralty, but those fade into the background when we remember how splendidly the Navy, of which he was the responsible political head, met its responsibilities. It has guarded our shores and our overseas commerce and driven the enemy flag from every ocean. The nation must not be allowed to forget that.

Mr. Churchill's Defence.

The Institute of London Underwriters has issued a new set of Institute Warranties, which take effect as from November 11. Two alterations are noticeable in the new issue, though only one geographical difference is made. This is in Warranty No. 3, which heretofore fixed Cape Kanin as the extreme eastern limit of restriction. The new warranty moves the line some 20 deg. west to North Cape, the object of this being to place the new Russian port of Kola within the prohibited area. The alteration of wording is found in Warranties Nos. 3 and 5, wherein the new style vessels are warranted "not to sail for or from" prohibited ports. The old wording of "not to enter the White Sea," &c., and "not to proceed to any port," &c., allowed the vessel to proceed to the verge of the prohibited place before the warranty was broken, while under the new style the warranty is broken as soon as the vessel sails if her destination is one that is excluded by the Institute Time Warranties.

New Institute Warranties.

The new Orders in Council with regard to shipping cannot fail to have their effect on marine insurance. The carrying of cargoes between foreign ports by foreign-owned steamers only will mean that in some cases the insurances on the cargoes will be placed abroad, though this will be counterbalanced in the cases where the insurance comes to the British market by the rates, which are frequently higher on foreign-owned steamers than on our own. With regard to the requisitioning of steamers, underwriters will be in a worse case than ever. Presumably the commandeered vessels will be held covered at a premium to be arranged, but unless the Government are kinder in the matter of revealing voyages than they have been up to the present the voyages will frequently be completed before news of them reaches the insurer. This gives no chance of re-insurance in the case of undesirable voyages, and the underwriter is forced to run risks that he would have been glad to re-insure at a loss had he but known where his interest was being taken to.

Underwriters and Requisitions.

Fires of alleged incendiary origin continue to be reported on vessels with American cargoes, and it is evident that nothing but the strictest vigilance on the part of the authorities will put an end to these atrocities. The latest and most serious of all the fires reported up to the time of writing is that on the steamer *Indian Monarch*, which has been abandoned at sea 420 miles south of St. Helena, at which place the captain and 17 of the crew have landed. She was a vessel of 4,383 tons gross register, built in 1904 by Russell & Co., of Port Glasgow, and is owned by Raeburn & Vérel, of Glasgow, who insure her on a value of £43,500. She was bound from New York to Auckland, and her cargo was of great value. Another vessel in similar trouble on the same voyage is the steamer *Rioauw*, a new steamer of the Nederland Line. She was built by A. Ma Millan & Co., Ltd., being completed in April, 1914, and is a vessel of 7,526 tons gross register. She is now in port at Cape Town, and measures are being taken to combat the outbreak. The fire on the steamer *Livietta* is also suspected of incendiary origin, but the reason for such an act on the part of the German agents in America would be hard to find, as she was bound from Port Arthur, Texas, to Buenos Ayres with case oil. After the fire had got hold of her she drifted ashore near Galveston

Incendiary Fires.

[illegible] the [illegible] vessel was [illegible] and the Hansa Eventyr overtook her, when she was [illegible] captured and taken into port at Salcombe. The *Hansa* is a two-decked iron screw steamer, the property of Nicholas & Co., Greece, being 2,760 tons gross register, built in 1899, and owned by Dall Olsen & Co., of Sandefjord.

Australia and the South Pacific

The Messageries Maritimes have now decided to give effect to the changed itinerary for their Australian steamers which was under consideration before the war began, with the result that, instead of proceeding to Sydney, via Fremantle, Adelaide, and Melbourne, they will go first to Noumea, New Caledonia, and thence to the New South Wales port, giving, as we understand, much more attention to the cargo trade than has hitherto been the case. As a matter of fact, it is by now well known that France intends in future to develop her trading interests in the South Pacific, where her shipping activities have been greatly extended during the past few years, notably by the establishment of a service from Nantes to Tahiti, the New Hebrides, and New Caledonia. Japanese enterprise in the Pacific Islands is also becoming more pronounced, but it will not be possible to say definitely how the situation is likely to open up until after the cessation of hostilities, seeing that the future government of former German possessions there has still to be settled. It may be remembered that last year the German Government concluded an agreement with the Norddeutscher Lloyd for sailings to and from South Seas destinations, including New Guinea, Kaiser Wilhelmsland, and the important parts of what was known as the Bismarck Archipelago, all of which, however, are now in British occupation, so that it is not likely that the contract will ever come into operation. At the same time, it was agreed to discontinue the subsidised Australian service because of the heavy loss sustained in competition with the P. & O. and Orient companies. With the French itinerary rearranged, and German ships withdrawn from the route, passenger traffic between Europe and the Antipodes will be left exclusively in the hands of British steamship lines for some time.

Persian Gulf Trade.

The latest German military development, with a view to the opening up of a direct route under Teutonic control between Hamburg and Baghdad, is simply further evidence, if that were necessary, of the great importance formerly attached by Germany to the extension of her sphere of influence in Persia, and perhaps more particularly at Persian Gulf ports. Until a few years before the outbreak of war the shipping trade of that part of the world was practically monopolised by British companies, but when the construction of the Baghdad railway was undertaken the Hamburg-Amerika Line established a monthly service of steamers to Muscat, Bunder Abbas, and Bussoral, while about the middle of last year Herr Ballin's concern not only added a passenger service to its line of cargo steamers from Hamburg, but also concluded an agreement with a Liverpool company for the institution of joint sailings from both the United Kingdom and the Continent. In addition, an Anglo-German understanding was arrived at in connection with the navigation of the Tigris and the Euphrates, while German traders had begun to establish businesses, and successfully too, at various points in the Gulf. Needless to say, all these arrangements have broken down, yet all the same they show what would in all likelihood have happened by now if Germany had not broken the peace. From a British point of view, and notably that of our Indian Empire, it is obviously important that every advantage should be taken of our opportunities in Mesopotamia and the Persian Gulf. Prior to the opening of hostilities, British shipping companies, there is every reason to believe, had fully grasped the necessities of the situation, and, naturally, it may be safely assumed that they will give even closer attention to them now.

Prize Appeals.

Two notable judgments in Prize appeals were delivered last week, but as we have already dealt with the cases in their earlier stages we need not go elaborately into them. The two cases, which both concern cargo, are those of the *Roumanian* and the *Odessa*. In both the Judicial Committee of the Privy Council, which acts as the appellate tribunal in regard to prize cases, has upheld the decisions of Sir Samuel Evans, the President of the Admiralty Division. It will be remembered that the point at issue in the case of the *Roumanian* was whether petroleum shipped to a German company, but diverted at sea on the outbreak of war to a British port, and subsequently pumped into tanks within the port of London, was lawful prize. The argument placed before the Courts was that it had become private property on land, and as such was by international law exempt from confiscation. This contention was repudiated both by the Prize Court and the Privy Council, on the ground that the petroleum having from the time of the declaration of war been liable to seizure as prize did not cease to be so liable because the owners of the carrying vessel pumped it into tanks for safe custody. In the *Odessa* case, the Judicial Committee refused to afford recognition in the Prize Court to the claims of British bankers as pledges of cargo belonging to enemy subjects. The reason given for the decision was this. The recognition of liens or other rights arising out of private contracts would so seriously interfere with the belligerent rights of capture that the Courts must refuse to recognise such liens. But the Judicial Committee categorically affirmed that the right of the Crown to redress hardships to individuals in relation to such transactions remained unimpaired.

Dilution of Labour Scheme.

The Dilution of Labour Scheme which the Central Munitions Labour Supply Committee drew up and recommended to the Minister of Munitions is now to all intents and purposes in operation, the executive council of the Amalgamated Society of Engineers having at last agreed to co-operate with the authorities in the necessary re-organisation. It will take both employers and employees some time to master the details of the re-arrangement, and while they are familiarising themselves with them there will probably be a good deal of friction. But the principle of the scheme is not at all difficult to grasp. It is that no skilled man shall be employed on work which can be done by semi-skilled or unskilled male or female labour. Applied without bias and in the spirit of patriotism which the exceptional circumstances of the moment call for, the effect of it should be to release for more important work many skilled men who are employed in shops doing repetition work. The result will be a greatly augmented output not only of easily produced munitions but also of the more intricate instruments of warfare for which there is still great need. We shall be unwise, however, to shut our eyes to the fact that although the scheme has the approval of Trade Unionism it will depend for its success on the spirit in which the workmen seek to carry it out. A great many of the rank and file frankly dislike the whole business, and some of their leaders do not appear to have the courage appropriately to deal with them. An outspoken declaration on the subject by the executive council of the Amalgamated Society of Engineers would go a long way to clear the air, and it is a pity that Mr. Brownlie and his colleagues have not so far seen fit to make one.

South Wales Coal Freights.

Last week we drew attention to the rapid rise which has taken place in outward coal freights from the United Kingdom, since the requisitioning of Greek steamers by the Hellenic Government, and also expressed the opinion that there would be an early further advance. This anticipation has been realised even to a more appreciable extent than was thought probable. In fact, rates during the past week to the Mediterranean have advanced about 1s. per

ton and about 6d. for the nearer trades. The extent of the appreciation is clearly shown below:—

	Week ended November 15, 1915.	Week ended November 8, 1915.	Rise.
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	Bay and Coast.		
Havre	16s. 9d.	16s. 3d.	6d.
Nantes	31 fr.	29 fr.	2 fr.
Rouen	19s. 6d.	18s.	1s. 6d.
	Mediterranean.		
Alexandria	50s. 6d.	48s.	2s. 6d.
Algiers	48 fr.	47½ fr.	½ fr.
Barcelona ...	38s.	37s. 6d.	6d.
Genoa	49s. 6d.	47s.	2s. 6d.
Gibraltar	29s. 6d.	28s.	1s. 6d.
Lisbon .	25s. 3d.	25s.	3d.
Marseilles ...	57 fr.	55 fr.	2 fr.
Port Said ...	51s.	48s.	3s.
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Rouen ...	19s. 6d.	18s.	1s. 6d.

Until the tonnage position is materially improved and merchants are able to obtain vessels to cover a greater proportion of their requirements than at present, no change can be expected, while the delays to shipping caused by bad weather, which is now to be anticipated, tends to further restrict available tonnage supplies, and automatically strengthens the position of shipowners.

The Auxiliary Coaster.

In some quarters there appears to be an impression that the auxiliary oil engine's lack of popularity in British coastal shipping is due to ignorance concerning its advantages. Owners do not, it is argued, know how greatly the installation of auxiliary engines of the hot-bulb or paraffin type increase earning power; if they did there would soon be, we are told, no windjammers at all at work in the waters around the United Kingdom. The truth is that nobody is really ignorant of the auxiliary oil engine's advantages in coastal service. On the contrary, the coastal auxiliary ship is the only ship of the type which is unanimously agreed to be convincingly an economic proposition. Ocean-going auxiliaries are admittedly, under the exceptional circumstances which prevail, making handsome profits for their owners; but when the state of trade returns to the normal they will almost certainly find it very difficult to compete with the much larger full-powered vessels. The difference between the ocean-going auxiliary and the coastal auxiliary is that while the one can be outbuilt the other cannot. The accommodation of the minor ports which coasting vessels serve puts a definite limit to dimensions which is well inside the size beyond which it is imprudent to go with vessels wholly or partially dependant upon canvas. The auxiliary oil engine's lack of popularity in the United Kingdom is really due to the fact that the majority of our coastal owners are single ship men, who either have not the money for auxiliary engines or who deem their investment to be sufficiently profitable as it is.

Fullness and Sea Speeds.

In his recent paper on "Ship Calculation, Resistance and Propulsion," read before the International Congress, Rear-Admiral D. W. Taylor referred to Sir Archibald Denny's remarks on the decided reduction of the block coefficient in low-speed cargo ships in late years. Sir Archibald had pointed out in his presidential address at the Institute of Marine Engineers that experience at sea with full cargo ships had shown that these do not give the regularity of service which slightly finer vessels do. Rear-Admiral Taylor, in his paper, suggested that if careful investigations of model results had been carried out it would not have been necessary to settle this question by trial and error in full-sized ships, as there has been published sufficient data to enable the competent naval architect to settle with quite satisfactory accuracy the relative financial results to be expected on service from vessels of varying form and fullness. We are inclined to think that he has missed the point of Sir Archibald Denny's remarks. With the facilities Sir Archibald has at his command no one is better able to estimate the probable performances of ships of different fullnesses, but only experience at sea can determine whether vessels may be made so full that they are much more adversely affected by rough weather than those of finer form. Whilst model experiments can give an accurate comparison of the performances of ships of different fullnesses in still water conditions they cannot take into account how these will be affected by average sea conditions. It has been shown by experience that vessels of, say, from ·7 to ·75 block coefficients can maintain a regularity of service which vessels of fuller block do not. Some interesting results showing this were given by Mr. Andrew Hamilton in a paper read before the Liverpool Engineering Society four years ago. His figures plainly indicated that the finer vessels he instanced were less affected by weather conditions than the fuller ships.

Future Naval Construction.

In the early days of the war the course of events seemed to indicate that the submarine had become the war vessel of greatest importance and that the days of the construction of huge battleships were over. Subsequent events have proved that submarines are extremely vulnerable and that the detection and destruction of these can be successfully carried out. On the other hand their great usefulness has been strikingly demonstrated in recent events in the Baltic and the Sea of Marmora. The necessity for both under water craft and large capital ships has been proved, and in both these types of vessels progress in design may be looked for. With regard to submarines, the probable direction in which development will take place will be in the attainment of still higher speeds and greater radius of action. These have been increased greatly in late years, but an authority has suggested that in the near future an admiral will want a flotilla of submarines to accompany his fleet and to accomplish this they must be capable of proceeding at a speed that will render them quite certain of being no encumbrance to the fleet and that they must be capable of keeping the sea as long as the battleship can. These requirements will necessitate the installation of machinery of great power, and the provision of a large capacity for fuel. These will demand longer and bigger vessels. High speed and great gun power will be the feature of future capital ships, and these will probably be obtained at the cost of armour protection. With the ever-increasing range of big guns the necessity for side armour becomes less pressing, as the decks offer a larger target than the sides. At several periods in the history of naval construction side protection has been sacrificed for speed and gun power, and it is possible that history will repeat itself in future.

Swedish Marine Engine Tests.

Some tests were recently carried out in Sweden for the purpose of comparing two widely different systems of propulsion for steamships. The vessels concerned were similar in other respects, one being driven by ordinary triple-expansion engines and the other on the turbo-electric system. The same propeller screws were used on both vessels in order to make the conditions of the trial as nearly alike as possible. Each vessel has a displacement of 2,250 tons and a speed of 11 knots. Their length is 225 ft., beam 36 ft., and draught 14·7 ft. In the turbo-electric design the propeller shaft, which carries a single screw, is driven by two synchronous motors arranged to transmit their power through a gear transmission with two pinions, each motor operating on one pinion. This transmission reduced the speed from 900 r.p.m. on the motor shaft to 90 r.p.m. on a propeller shaft, the total power delivered to the latter at 90 r.p.m. being about 900 h.p. The main purpose of the comparative trials was to determine the relative coal consumption of the two vessels, and it was guaranteed that the turbo-electrically propelled boats should show a saving of

THE GOVERNMENT CONTROL OF SHIPPING.

After many "demands and excursions" Government action has been taken in regard to the control of British merchant shipping and so far as the machinery by which this control is to be secured is devoid of elaborate rules, regulations and numerous restrictive orders, the proposals are commendable. It remains to be seen whether the two Orders in Council, which we reproduce on page 449, are in themselves sufficient to secure that control which is desirable—as distinct from unnecessary interference—are adequate, or whether, like so many powers invested in permanent officials by virtue of Acts of Parliament or Orders of the Privy Council, there will grow around these two relatively simple instructions a maze of irksome restrictions.

The Orders in Council permit the Board of Trade to do two things. One is to requisition British owned ships for the carriage of foodstuffs and, as embracing everything else, "of any other articles of commerce." It will be seen, therefore, that the terms of the Order are of the widest possible scope. Obviously it would be impossible to requisition such tonnage as owners might deliberately keep without the jurisdiction of the Government, and to prevent this the other Order in Council prohibits British vessels to engage in trade between foreign ports—a bigger interpretation be it noted than neutral ports—unless such ships are licensed by the Board of Trade to engage in such trade. This throws the onus of proof of the necessity for such trading upon the shipowner.

There is thus in the two Orders the germ of beneficient regulation of shipping. There is also abundance of scope for departmental mischief, and unless more effective control is exercised in the selection of vessels and routes than has been evidenced by the Admiralty, there is infinite capacity for economic chaos. It is therefore a matter for congratulation that the President of the Board of Trade is himself well versed in the business of shipowning and that the task of adjudicating on the granting of licences is in the hands of a strong committee presided over by Mr. Maurice Hill, K.C. The vice-chairman is Mr. F. W. Lewis, who as Deputy Chairman of Furness, Withy & Co., Ltd., and by virtue of the large interests he has in shipping, will command the confidence of shipowners generally. Other members of the committee include such strong personalities and able advisers as Mr. H. A. Sanderson, President of the International Mercantile Marine Company and Chairman of the Oceanic Steam Navigation Company; Mr. Fernie; Mr. Scholefield, of Newcastle; Mr. T. Paterson Purdie, of Purdie, Glen & Co., Glasgow, and President of the Clyde Steamship Owners' Association; and Mr. Burton Chadwick, of Joseph Chadwick & Son, Liverpool. It is said that there is no intention of taking vessels from established services between foreign ports, and, indeed, it is difficult to see how it could be otherwise, since such a withdrawal would only lead to delivering very rich trading routes into the hands of neutral competitors and react disastrously upon British maritime supremacy.

The duty of supervising the requisitioning of ships is to be in the hands of Mr. J. H. Whitley, M.P., Deputy Speaker of the House of Commons, and Mr. F. C. Gardiner, President Elect of the Chamber of Shipping, Mr. E. G. Glover and Mr. R. D. Holt, M.P. One would have welcomed a definite announcement of co-ordination in this work of requisitioning between the Board of Trade and the Admiralty to avoid that rivalry concurrent with overlapping departments.

The task of regulating our mercantile marine is a difficult one and attempts at interference are likely to bring unexpected and untoward results. It remains to be seen whether this new departure in Government control is effective and to what extent by the consequent disturbance of the ebb and flow of neutral shipping it is able to adapt an inadequate mercantile marine to the emergencies of commercial eruption. Already there are signs that the disturbance of the *laisser faire* policy, which is not always a bad one for Governments to follow in relation to commercial enterprise, has dislocated the relatively smooth working of chartering. Time will show whether this is due to a temporary disorganisation of the normal channels or to difficulties more deeply rooted and less easily eradicated.

SAFE LOADING.

It is reported that the sea-going motor-ship *Zeearend* recently made a trip from Goole to Rotterdam with coal, after discharging which she took on board a general cargo for London. When the deck load was almost complete the vessel capsized. With the assistance of three floating derricks and electric pumps the *Zeearend* was refloated and taken into dock.

It is rather disconcerting to find an accident of such a nature happen in these days in spite of all that has been written on the subject of stability, and in spite of the many experiences of the past which have demonstrated the dangers of careless lading. The recent accident to the *Eastland*, and that mentioned above, show the necessity for those in charge of ships knowing the characteristics of the vessels under their command. The forces which govern the stability of ships are well known to technical men, and it is now the exception if a vessel is constructed which would not be safe from capsizing if properly laden. Ship's officers, on the whole, are not conversant with the principles of stability, but mechanical appliances are now available, such as Ralston's stability indicator, which may be used to give the correct metacentric height under any condition of lading for a particular ship. The adoption of the term "metacentric height" is perhaps unfortunate. Many years ago the late Mr. Macfarlane Gray said "I think a great deal of the difficulty with regard to this metacentric question is caused by the grand name metacentre."

When a vessel is floating upright at rest, her centre of gravity must lie in the same vertical line with the centre of buoyancy. If these centres are not in the same vertical line the vessel will heel over until they are. The centre of gravity is a fixed point in the ship, but the centre of buoyancy varies in position as the ship is inclined. The metacentre may be defined as the intersection of the line of action of the buoyancy when a ship is inclined through a small angle, with the line of action of the buoyancy when the ship is upright. Within the limits to which the metacentric method applies, a ship may be compared to a pendulum having its point of suspension at the metacentre and its weight concentrated in a bob at the centre of gravity. If the centre of gravity of a vessel lies below the metacentre she tends to return to the upright when inclined, that is that the vessel is stable. If the centre of gravity lies above the metacentre she tends to move further away from the upright if inclined, accordingly the vessel is in unstable equilibrium. The metacentre measures the height to which the centre of gravity may be raised without rendering the vessel unstable when upright. The distance between the centre of gravity and the metacentre is called the metacentric height. When a vessel is being designed an estimate is made of the position of the centre of gravity and the form is made such that the metacentre will be a certain distance above this centre of gravity, so that a metacentric height suitable for the particular trade of the vessel will be ensured. The desired height varies in different types of ships. In most modern passenger ships it is made comparatively small, probably 1 ft. or so, in order to ensure easiness in rolling. Unusual types of vessels such as floating docks,

may have a metacentric height of 100 ft. One of the broadest vessels that was ever constructed, and at the same time one of the steadiest, was the Russian Imperial yacht *Livadia*, which had a very high metacentre.

It is comparatively easy for naval architects to design stable vessels, but the careless loading of cargo ships can undo the work of the designer. There are many vessels afloat in which the cargo carried is more than twice the weight of the vessel, including her machinery and equipment. In such cases the naval architect can only control in the design about one-third of the total weight of the vessel and her cargo, leaving the remaining two-thirds in the hands of the owner, master, or stevedore. Accordingly, whatever may be the qualities of the empty vessel in respect of stability they may be greatly modified or entirely altered by the manner in which she is loaded. It is the loading to which one must look in the large proportion of cargo-carrying steamers for the due preservation of such stability as is necessary for safety at sea. Besides this question of loading another point arises. A vessel may leave port with a reasonable positive metacentric height, and therefore with sufficient stability, but the consumption of bunker coal during her voyage may reduce this by as much as from 1 to 2 ft. By the end of the voyage the positive stability may be negligible, and vessels with low freeboard may be in grave danger.

These facts point to the necessity of ships' officers becoming acquainted with the principles which govern stability. Several shipbuilders hand over with the vessels they construct a little book describing the technical qualities of the particular ship. The principles of stability are stated simply therein, and suggestions given as to how to maintain the requisite amount of metacentric height.

Whilst certain owners and captains may refrain from any consideration of the information thus given by those who know the qualities of the ship, it has been found that many of our leading owners of passenger and cargo steamers are extremely anxious to follow the guidance given and endeavour to deal practically with it. The point for the shipbuilder to observe is that this guidance should be given in a form which is thoroughly intelligible, so that it can be made good use of by those who are not conversant with the terms metacentre and metacentric height, but who could be impressed with the fact that the cargo should be stowed so as to have the centre of gravity low.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by Correspondents.]

ASCERTAINMENT OF DRAUGHT.

Sunderland,
November 12.

To the Editor of Shipbuilding and Shipping Record.

Is there any suitable method of ascertaining the draught of water of a steamer prior to her taking in any cargo or bunkers?

For example, from the L.B.D. and coefficient of fineness one can easily estimate the total displacement, but one needs to know the "equipped" draught in order to get the cargo she will carry.

A short and simple way of arriving at this, even if only approximate, would, I am sure, be of great use to many of your readers, who are unable to, or have not the necessary figures to take out a displacement scale.

G. SWAINSTON.

[The answer to this question is closely allied to the subject of the ratio of deadweight to displacement which was discussed very fully by several authorities in these columns last August. Whilst this ratio may vary considerably, it may be accepted that the average full steamer of the tramp type carries a total deadweight (which includes stores and bunker coal) amounting to 70 per cent. of her full loaded displacement. In order to enable a fairly satisfactory answer to be given to the above inquiry the figures for a large number of ships have been examined and the 70 per cent. value given above has been found to be good average practice for cargo vessels of from 300 to 400 ft. in length. If vessels were box-shaped the light draught of the average cargo ship would be 70 per cent. of the load draught, but owing to the vessel being considerably finer at the lower waterlines than at the higher the light draught is about 10 per cent. greater than if the vessel were box-shaped, *i.e.*, that the light draught is about 33 to 35 per cent. of the load draught. An illustration will make clear these points. A vessel 310 by 42 by 22 ft. load draught has a block coefficient of ·795 and displaces 6,452 tons. Her total deadweight is 4,580 tons, or 71 per cent. of the total displacement. Her light draught is 7 ft. 4 in., at which she displaces 1,872 tons, the light draught being ·333 of her load draught. It must be recognised by any who use these figures that they do not claim to be anything more than a fairly accurate guide to what may be expected. —Ed. *S. & S.R.*]

SOME ALTERNATIVE TYPES OF PROPELLING MACHINERY FOR A 19¼-KNOT STEAMER.*

Part I.

Within the past few years many systems of propelling machinery have been devised for use in ships, and some of these have been used with considerable success in practice. The mechanical-gear turbine drive, introduced and consistently advocated by Sir Charles Parsons, has met with approval by many, as also has the hydraulic gear of the Föttinger type. More recent is the introduction of successful turbo-electric systems. The latter have been fitted into one ship in this country, four in the United States of America (including a battleship now building), and one ship in Sweden. In addition, there was a 500-h.p. Diesel-electric ship built in Sweden about 1903, which is still running in Russia on the Volga. Seven steamers are at present building in Sweden which are to be fitted with the Ljungström system of turbo-electric propulsion, aggregating 10,200 h.p. Notwithstanding the many claims of the turbine, the reciprocating engine remains first favourite for shipping of average tonnage. Lloyd's returns show, after deducting therefrom the tonnage of warships and fast liners, that the turbine has not yet managed to secure a firm hold on the average tonnage which embodies the strength and wealth of this country's shipping. The revival of superheating means added life for the piston engine, and makes it very difficult for the turbine to compete against a reciprocating engine so fitted, if coal consumption alone is considered.

The reason, of course, why the turbine, as at present designed, does not suit the average ship is primarily due to the difficulty in securing reasonable steam consumptions on the revolutions of turbines which are necessary to secure good results from the propeller. To meet this difficulty the mechanically geared turbine was introduced by Parsons, the hydraulic gear by Föttinger, and the turbo-electric drive by Mavor, Emmett, and Ljungström.

In view of these various systems including piston engines, and the many factors which contribute to the successful performance of a ship at sea, the author thought it would be of interest to select a ship and work out weights, coal consumption, and space necessary for some alternative types of machinery, and to compare these from a commercial point of view.

The results are given in the accompanying Tables I, II and III, and outline general arrangements are shown on page 439.

The ship selected is of the intermediate passenger and cargo type, such as is usually found engaged in the North Atlantic trade. Her measurements are as indicated in Table I, viz., 600 by 72 by 46 ft., the mean mid Atlantic draught being 27 ft., with a displacement of 21,000 tons. An average sea speed of 19¼ knots is maintained throughout the year.

* Paper read by Mr. James Dornin, Member, before the Institution of Engineers and Shipbuilders, Scotland, on October 26.

[illegible] the type of machinery selected. In this connection it should be [illegible] moment is almost constant for most of the types.

The various designs may be described as follows:—

(*a*) Two sets of quadruple-expansion steam engines driving three screw propellers fitted at 85 r.p.m. Saturated steam is raised in six double-ended and four single-ended cylindrical boilers working at 240 lb. pressure per sq. in. under Howden's system of forced draught. The engines are designed for a vacuum in the condensers of 27 in. at 55° Fahr. sea temperature and 30 in. barometer. All auxiliary steam is utilised in the feed heater where a feed temperature of 210° Fahr. is realised.

(*b*) One set of either Parsons or Brown-Curtis turbines is arranged in series on four shafts running at 290 r.p.m. The high-pressure and intermediate-pressure turbines are on the outer shafts, and the two low-pressure on the inner shafts. Reversing turbines are incorporated in the low-pressure ahead turbine casings. Each shaft has one direct-driven propeller. The boilers are as in (*a*), with the working pressure reduced to 200 lb. per sq. in. The vacuum has been increased in this design to 28 in. under the same conditions as (*a*), and the auxiliary steam is also employed in the feed heater.

(*c*) This design is similar to (*a*), only superheated steam is used in the engines. The resultant economy enables the work to be done in six double-ended and three single-ended boilers, *i.e.*, a single-ended boiler less than (*a*). The superheater is of the Schmidt smoke-tube type designed to maintain at the engine stop valve a superheat of 200° Fahr.

(*d*) This is as (*b*), only superheated steam is used. The boilers are the same as for (*c*), with the pressure at 200 lb. per sq. in. 100° Fahr. superheat is used in this design.

(*e* and *f*) These designs are for geared turbines arranged on two shafts. The former consists of two Parsons or Brown-Curtis double-flow turbines running at 1,000 r.p.m., and driving twin-screw propellers at 200 r.p.m. through hydraulic gearing of the Föttinger type. The latter has four similar single-flow turbines arranged in series, driving the propeller shafts through mechanical gearing usually associated with the name of Parsons. The revolutions for (*f*) are 1,800 and 160 per min. for the turbines and propellers respectively. The boilers are the same in the two designs, excepting the degree of superheat, (*e*) having 200° Fahr., and (*f*) 100° Fahr. superheat. The working pressure is 200 lb. per sq. in., and the vacuum under conditions as in (*a*), 28½ in.

(*g*) The two shafts of this design are driven at 85 r.p.m. through mechanical gearing of the Parsons type by electric motors running at 500 r.p.m. These in turn are driven from two Ljungström turbo-dynamos which run at 3,000 r.p.m. As in (*e*) and (*f*), the vacuum is 28½ in., with a working pressure of 200 lb. per sq. in., only a superheat of 260° Fahr. is maintained at the turbine stop valve by [illegible] type as fitted in (*c*), (*d*), (*e*) and (*f*) proposals. The boilers are seven in number—four double-ended and three single-ended, all of the cylindrical type. The engine room casing of this design is closed, so as to prevent access of sea water down the hatch to the dynamos and motors, provision at the same time being made for ample ventilation of all spaces.

Other designs have been passed over, but mention might at least be made of the well-known "combination scheme" of two reciprocating engines on the wing shafts and a Parsons exhaust type turbine on the centre or third shaft. This was introduced to make the turbine applicable to ships having speeds below 18 knots, but with the advent of geared turbines the type is no longer necessary. The "combination scheme" gives steam consumptions lower by 7½ per cent. than quadruple-expansion engines driving the propeller [illegible] of this about 4½ per cent. is lost in the additional power required to drive the ship caused by lower hull and propeller efficiency. The remaining 3 per cent. loses its commercial value when the weight and increased size of engine room is considered in relation to the higher capital cost, increased running expenses, and the decreased deadweight.

Designs (*a*), (*b*), (*c*), (*d*) and (*f*) call for no further description than that already given, as they are more or less familiar to all. In the mechanical-geared design (*f*) some difficulty was experienced in proportioning the pinions and gear wheels. A high pitch-line velocity and large load per inch of width of pinion in conjunction with increased propeller revolutions have made the transmission of 5,450 h.p. per pinion possible.

The Föttinger transformer used in design (*e*) essentially consists of a primary wheel bolted to the turbine shaft, and a secondary wheel bolted to the propeller shaft. The primary wheel is keyed to the turbine shaft. The secondary wheel for ahead running, which consists of two wheels, is bolted to the secondary or propeller shaft. Between the secondary wheels stationary guide blades are fitted. The astern primary wheel is also keyed to the turbine shaft. The astern secondary wheel, consisting of two sets of blades, is coupled to the propeller shaft through the ahead secondary wheel already mentioned. Guide blades are fitted in the astern circuit between the secondary wheels.

If the ahead system is filled with water and the turbine started up and run at constant speed, pressure differences are established between the inlet and outlet of the primary wheel. These result in the setting up of a current which immediately leads to a circulation inside the wheels, whereby the water finds its way back from the outlet of the primary wheel through the blades of the hitherto stationary secondary wheels and the set of guide blades to the entrance of the primary wheel. The reaction set up by the water in its passage upon the blade surfaces of the secondary wheels soon sets these in rotation, the speed increasing until the condition of uniform motion is reached.

The astern circuit works in a similar manner, with the exception that the direction of flow is reversed in fixed guides and, therefore, reverses the propeller shaft. A small steam-driven pump is fitted for quickly filling and emptying the circuits and also for making up the leakage.

The Ljungström turbines used in design (*g*) are of the radial-flow reaction type, having the rotors revolving in opposite directions. The steam enters at the centre of the shafts, and flowing outwards exhausts to the condenser. The two opposite rotating turbine wheels are carried by shafts flanged to the rotors of the generators. Between the wheels are fixed the blades, every second blade ring being fixed to one of the turbine wheels and the intermediate rings fixed to the other wheel.

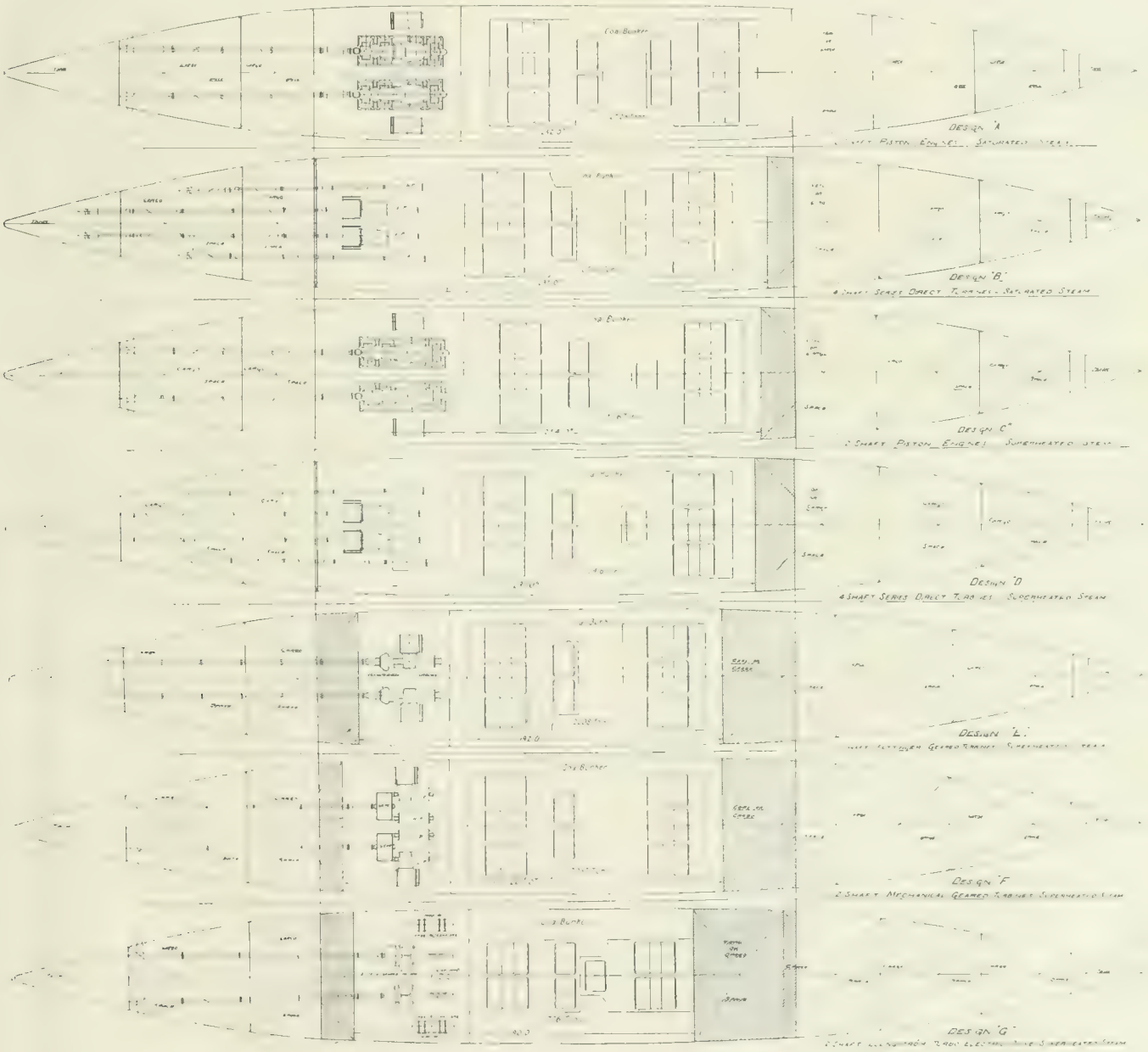
The turbine comprises a complete system of heat expansion devices which prevent the occurrence of injurious thermal stresses or deflections. Great differences in temperature arise between the blade rings and the thick turbine wheels when heating up and when changing running conditions. These are caused by the different rates of heating, or cooling, arising from differences in mass or cooling surface. The novel conical rings used enable the various parts to adapt themselves to the new conditions and dimensions without appreciable tensions. The dummies and shaft packings are of the labyrinth type. A detailed description of this turbine and also of the Föttinger transformer will be found in several books in the Institution library. Descriptions have also appeared in the technical press. As this turbine is very compact and light it is mounted direct on its condenser.

The stationary and revolving parts are of nickel steel, and provision is made throughout to permit of the use of steam of high pressures and superheat. As the rotors revolve in opposite directions, the relative revolutions of the blade discs are 6,000 per min., and, therefore, only one-quarter the number of blade rows are necessary as compared with a single rotation type turbine of 3,000 r.p.m.

The dynamos and motors are of the usual design for 2,500 volts pressure, alternating current, and three-phase. The manœuvring is mainly done electrically, speed regulation being obtained by resistances in motor circuits when manœuvring, and by altering the speed of the turbines when reduced power is required for a lengthened period of time. Reversal is effected by interchanging the poles of the phases.

The figures calculated in Tables I, II and III are based on actual performances of machinery recently built. (*a*) and (*b*) are actual ships. (*c*) and (*d*) are deduced from (*a*) and (*b*). (*e*) is actual. (*f*) is deduced from performances of well known geared installations, and (*g*) from the Svea Company's boat turbine *Mjölner*.

Line 1 of Table I gives the dimensions of ship considered, together with service speed and mean mid-Atlantic displacement and draught. The number of propeller shafts are as stated in line 2, these being selected with due regard to propeller performance, steam consumption, and weight of prime mover. In line 3 the revolutions per minute of propeller shafts are given. Eighty-five r.p.m. is normal for piston engines, and in fixing the revolutions of the turbine designs, attention had to be paid to items other than high propeller efficiency. Thus in (*b*) and (*d*) revolutions lower than those selected increase the propeller efficiency, but rapidly increase the weight of turbines and their steam consumption. The gears of (*e*) and (*f*) control within narrow limits the revolutions for these designs, the ratio of transmission being important for efficiency and dimensions in the former, whilst the diameter and length of the pinions in the latter must be kept within practical units. The combination of mechanical with electrical gears in (*g*) enables one to select the same revolutions as for the basis in (*a*) design. The



Outline General Arrangements of Machinery and Cargo Spaces of Seven Vessels.

effective horse-powers required on the basis of naked models are tabulated in line 4. These have been calculated by Taylor's method and found to closely agree with some tank results in the author's possession. (*b*) and (*d*) are credited with less effective horse-power than the other designs, on account of the better form resulting from four-shaft ships. The effect of appendages is reflected in the figures for effective horse-power in line 5, the smaller bosses in (*e*) and (*f*) accounting for about 200 e.h.p. less than the same models (*a*), (*c*) and (*g*), which also have two screws, but much larger bosses consequent on the slower running propellers. The bosses in (*b*) and (*d*),

[illegible] and sweeter, are kept in pumpers in lots of two, and, [illegible] are [illegible] as required.

Lines 6 and 7 give the wake and thrust deduction. They have been calculated from the values given by Froude and Taylor, the values so found being modified in accordance with Luke's valuable papers on these subjects.

Line 8 is obtained from 6 and 7, and line 9 gives the propeller efficiency based on the model experiments carried out by Froude, and published in 1908. Except on rare occasions the efficiency so found does not agree with that of the propeller as fitted, and the corrected value is given in line 10. As was to be expected, the slower running propellers give a high efficiency. No difficulty should be experienced in obtaining equal efficiency of propellers in (*e*) and (*f*), notwithstanding the difference in revolutions, for both the pitch ratio and area ratio are capable of being modified to attain this

Table I.—Comparison of Horse Powers, Efficiencies, &c.

Length. [illegible]		Depth.	Draught.	Displacement	Speed
[illegible]	7[illegible]	[illegible]	[illegible]	[illegible] tons.	19¼ knots.

No. 1 Record Loss.

Reference letter	A	B	C	D	E	F	G
Design	[illegible]	4-shaft series direct turbines.	[illegible]	[illegible]	2-shaft turbine, hydraulic gear	2-shaft turbines, mechanical gear.	[illegible]
	Saturated steam			Superheated steam			
2. No. [illegible]	[illegible]	4	2	4	2	2	2
3. Revolutions per min.	85	[illegible]	[illegible]	[illegible]	200	160	85
4. I.H.P. [illegible]	11,430	11,100	11,430	11,100	11,430	11,430	11,430
[illegible], working [illegible]	[illegible]	12,400	[illegible]	12,400	12,300	12,300	12,500
6. Wake	[illegible]	[illegible]	0·165	0·20	[illegible]	0·165	[illegible]
7. Thrust deduction ...	[illegible]	[illegible]	0·15	0·15	0·15	0·15	[illegible]
8. Efficiencies—Hull ...	[illegible]	[illegible]	0·99	1·02	0·99	[illegible]	[illegible]
9. [illegible]	0·695	[illegible]	0·695	[illegible]	[illegible]	0·64	0·70
10. [illegible]	[illegible]	0·577	0·647	0·577	0·595	[illegible]	[illegible]
11. Do., mechanical	[illegible]	[illegible]	0·903	0·97	0·98	0·97	0·97
12. Propulsive [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0·572	[illegible]
13. I.H.P.	[illegible]	[illegible]	21,650	[illegible]	[illegible]	[illegible]	[illegible]
14. S.H.P.	—	21,800	—	21,800	21,300	[illegible]	[illegible]
15. Propulsive coefficient [illegible]	[illegible]	0·51	[illegible]	0·51	0·537	[illegible]	0·571

difference. The difference in efficiency between (*a*) and (*g*) is accounted for by the more uniform torque and thrust in the latter.

The revolutions of 160 selected for design (*f*) must not be taken as representing the lowest speed at which a Parsons geared installation will run. For designs other than the one under consideration it is usually possible to select rates of rotation which give propeller results almost equal to, and at times better than, piston-engined ships. In the case of ship (*f*) it is the large horse-power per pinion that suggested 160 as suitable revolutions for 19¼ knots. The speed of 200 r.p.m. is a practical minimum for the hydraulic gear in design (*e*), and for this reason the system is not, in general, applicable to low-speed vessels.

By mechanical efficiency, mentioned in line 11, is meant the sum of all the mechanical losses between the point where the horse-power developed is measured and the power delivered to the propeller. Thus in (*a*) and (*c*) it includes the losses within the main engines, those in driving some pumps, and the frictional losses in the thrust block and line shafting. The overall loss is, as indicated on line 11, 9·7 per cent. For the other designs 2 per cent. loss is assumed for line shafting and 1 per cent. for thrust block friction, which latter is of the ordinary horse-shoe type in all the designs.

As the overall efficiency of transformers used in (*c*) includes the thrust block loss no account need be taken of it in line 11.

The propulsive efficiency in line 12 is the product of lines 8, 10 and 11, and these figures divided into the corresponding powers in line 5 give the indicated horse-power or shaft horse-power in lines 13 or 14.

The propulsive coefficient has been added for convenience in

Table II. Comparison of Coal Consumptions, Weights, &c.

Reference letter	A	B	C	D	E	F	G
Design	[illegible]	4-shaft series direct turbines.	[illegible]	[illegible]	2-shaft turbine, hydraulic gear	2-shaft turbines, mechanical gear.	[illegible]
	Saturated steam			Superheated steam			
1. I.H.P.	21,650		21,650				
2. S.H.P.		21,800		21,800	21,300	21,350	20,600
3. Primary I.H.P.	21,650	21,800	21,650	21,800	23,450	21,800	22,600
4. R.P.M. Propellers	85	290	85	290	200	160	85
5. Do. Turbines ...	—	290		290	1,000	1,800	3,000
6. Working pressure, lb.	210	200	210	250	200	200	200
7. Superheat, Fah.	Nil.	Nil.	200°	100°	200°	100°	265
8. Vacuum, inches	27	28	27	28	28½	28½	28½
9. Steam per i.h.p. hr., main engines, lb.	12·71	11·86	11·4	10·9	9·9	10·1	7·4
10a. Steam per hr., main engines, lb.	274,800	258,400	225,000	238,000	211,050	220,200	167,240
11. Steam per hr., all auxiliaries, lb.	43,000	43,600	36,000	38,000	35,000	35,000	29,000
12. Total pounds	318,000	302,000	261,000	276,000	246,050	255,200	196,240
13. Equivalent coal per hr., lb.	31,800	30,200	27,200	28,200	25,700	26,000	20,650
14. Coal used per i.h.p. hr., lb.	1·47	1·385	1·257	1·292	1·205	1·218	1·032
15. B.T.U.'s. per h.p. hr.	23,650	19,400	17,600	18,100	16,900	17,050	14,500
16. Distance run in nautical miles per ton of coal.	1·475	1·426	1·585	1·573	1·68	1·67	2·09
17. Economy over A, per cent.		5	11½	11½	19	18	35
18. Boilers—No.	6 d.e. & 4 s.e.	6 d.e. & 4 s.e.	6 d.e. & 3 s.e.	6 d.e. & 3 s.e.	6 d.e. & 2 s.e.	6 d.e. & 2 s.e.	6 d.e. & 3 s.e.
19. Do., heating surface, sq. ft.	52,000	52,000	48,750	48,750	45,500	45,500	55,750
20. Do., grate area, sq. ft.	1,232	1,232	1,155	1,155	1,078	1,078	847
21. Draught	Howden's	Howden's	Howden's	Howden's	Howden's	Howden's	Howden's
22. Coal per day, tons	381	724	652	662	576	579	422
23. Eight-days bunkers, tons	2,728	2,592	2,336	2,416	2,208	2,232	1,776
24. Weight of machinery, tons	3,675	2,965	3,610	2,900	2,445	2,695	2,310
25. Weight of machinery, plus weight of bunker coal, tons	6,403	5,557	5,946	5,316	4,653	4,837	4,086
26. Gain in deadweight, tons	—	846	457	1,087	1,750	1,566	2,317
27. Length of machinery space, ft.	252	237	234	231	192	201	189
28. Saving in machinery space, ft.	—	15	18	21	60	51	63
29. Cub. capacity gained ft.	—	18,100	21,200	24,200	64,900	56,970	80,600

line 15, as a number of designers base their calculations on the effective horse-power of the naked model, line 4. The astern horse-powers expressed as a percentage of the full ahead power is 95 per cent. in (*a*), (*c*) and (*g*), 80 per cent. in (*e*), and 60 per cent. in (*b*), (*d*) and (*f*).

Table II shows the steam and coal consumptions of the various designs, also weights of machinery and particulars of extra deadweight and cubic capacity.

Designs (*a*) and (*b*) are adapted for saturated steam, the remaining designs for superheated steam. The use of superheated steam is advocated on the grounds of economy in fuel and lighter weight of machinery, these reacting on the ship and causing the earning power of the same to be augmented.

There need be no fear of trouble arising out of using superheated

steam on piston engines, provided attention is paid to the design of the packing rings in the pistons and piston valves, the relative hardness of the rings and liners being important. The cylinder lubricant should be a good quality mineral oil, fed in under pressure to the steam side of the valve.

Lines 1 and 2 are reproduced from Table I for convenience, and represent the powers as measured either by indicator diagram or torsionmeter. These powers are the average ones which must be maintained at sea under all conditions of sea and weather to enable the sea speed to be realised. By primary horse-power in line 3 is meant the power which must be put into the prime mover to provide the necessary horse-power in line 1 or line 2. For (*a*), (*b*), (*c*) or (*d*) it equals the respective indicated horse-power or shaft horse-power, since these engines are direct-coupled to the propeller shafts. Design

Table III.—Comparison of Annual Savings Effected, &c.

1	Assumptions made	(1) Ship at sea 150 days per annum, *i.e.*, 24 voyages.						
2		(2) Average cost of coal 25s. a ton.						
3		(3) One ton deadweight worth 14s.						
	Reference letter.	A	B	C	D	E	F	G
	Design.	2-shaft quadruple engines.	4-shaft direct turbines.	2-shaft quadruple engines.	4-shaft direct turbines.	2-shaft turbines, hydraulic gear.	2-shaft turbines, mechanical gear.	2-shaft turbo-electric gear.
		Saturated steam.		Superheated steam.				
4.	Coal used per annum, tons	51,150	48,600	43,800	45,300	44,400	41,850	33,300
5.	Saving over A, tons	—	2,550	7,350	5,850	9,750	9,300	17,850
6.	Extra deadweight carried per annum, tons	—	20,304	10,968	26,088	42,000	37,584	55,608
7.	Value of coal saved	—	2,550	7,350	5,850	9,750	9,300	17,850
8.	Value of extra dead weight		14,213	7,678	18,261	29,400	26,308	38,925
9.	Total saving	—	£16,763	£15,028	£24,111	£39,150	£35,608	£56,775
10.	Cost of ship ... £	650,000	650,000	668,500	670,500	673,000	672,000	678,000
11.	Gross annual return on cost, per cent.	12½	15	14	15¾	17¾	17	20
12.	B.T.U.'s per h.p. hour (engines only)	17,800	16,600	15,200	15,550	14,480	14,750	12,350
13.	Efficiency on measured h.p.	0·143	0·153	0·167	0·163	0·176	0·172	0·203
14.	Brake efficiency	0·70	0·68	0·74	0·70	0·76	0·71	0·87
15.	Probable years to render machinery obsolete	15	16	17½	17	18½	18	22
16.	No. of boiler furnaces	64	64	60	60	56	56	44
17.	Net annual return on cost, per cent.	7	9½	9	10	12½	11¾	15

(*e*) has to bear the loss due to the transformer, which loss includes that of the thrust block, the latter being incorporated in the former. The amount of this loss overall is about 9·2 per cent., as measured from an actual transformer of about the same size as the one under consideration. It may be mentioned that this loss can be somewhat reduced by allowing the heat generated within the transformer to raise the temperature of the boiler feed water. No allowance is, however, made for this gain in (*e*). The losses in the mechanical gears of design (*f*) have been taken at 2 per cent., and the primary horse-power of the turbines is, therefore, 21,800. In addition to the mechanical gear losses as in (*f*), design (*g*) has losses due to the dynamos, cables, and motors. These amount to 11½ per cent., including a 2 per cent. loss in the helical gears. Line 4 gives the revolutions per minute of the propellers. This has been transferred from line 3, Table I. The revolutions of the turbines are entered on line 5. (*b*) and (*c*), being direct-driven, have the same revolutions as the propellers. The turbines for the hydraulic gears (*e*) are designed for 1,000 r.p.m., which, giving a ratio of transmission of 5 to 1, yield a good efficiency in the transformer. As already mentioned, the design of gear wheels and pinions control to a considerable extent the revolutions, and this was kept in mind when selecting 1,800 as the speed of the turbines in design (*f*).

In design (*g*) the propeller shafts are geared to electric motors running at 500 r.p.m. The Ljungström turbo-alternators run at 3,000 r.p.m., which represents 6,000 relative r.p.m., between the opposite rotating blade discs. The working pressures in line 6 are in accordance with normal practice.

Superheated steam has been adopted in five of the seven designs. The quadruple engines are capable of using steam of 200° Fahr. superheat, as has been proved on many engines of this type recently built. Turbines (*d*) and (*f*) are at a disadvantage in respect to using highly superheated steam, on account of having reversible turbines. When superheated steam is admitted to an astern turbine for the purpose of reversing, work is done on it by the blades and rotor revolving in the ahead direction until the turbine stops. This raises the temperature of the steam to a considerable degree, and since the vacuum is more or less constant for any direction of rotation of turbine, the temperature gradient becomes very steep, and may involve a "strip" unless great care is taken in handling the steam. A similar state exists when the steam is admitted to the ahead turbine after reversing. For this reason, therefore, a moderate degree of superheat has been adopted in (*d*) and (*f*)—viz., 100° Fahr.

It is difficult to calculate this rise in temperature of steam entering an astern turbine when reversing, but some idea may be formed if it is assumed that the fan action of the turbine accounts for about seven-tenths of 1 per cent. of the full ahead power. The energy corresponding to this has to be transferred to the incoming steam in about 20 sec., and as a very small quantity of steam enters in that period of time, the necessary increase in temperature must be high. Sudden reversal or rapid manœuvring are therefore inadvisable in astern turbines, and the average time for from full ahead to full astern is about 27 sec.

With the electric or hydraulic gear the corresponding time is 11 sec.

As the turbines used in (*e*) and (*g*) always rotate in the one direction, no matter whether the propeller is going ahead or astern, and thus eliminate the troubles due to astern turbines, high superheats are used. In (*e*) a superheat of 200° Fahr. is adopted, and the greater part of this may be taken out in the nozzles of the impulse wheels fitted in the turbines. Design (*g*), having Ljungström turbines, can safely use the superheat advocated on account of its construction. As high a superheat as 350° Fahr. is successfully employed in this type of turbine, and that degree would have been adopted in design (*g*), only that cylindrical boilers are neither suitable for the necessary increase in pressure involved, nor for providing that degree of superheat without seriously affecting the actual evaporation of water per lb. of coal burnt.

The vacuum given in line 8 is fixed by considering the economy of the turbine in relation to the steam consumption of condensing plant, and to the construction of the low-pressure end of the turbine adopted. A vacuum of 27 in. is normal for the piston engine, as also is 28 in. for slow-speed turbines with standard blades, such as are employed in (*b*) and (*d*). Designs (*e*), (*f*) and (*g*) are arranged for a vacuum of 28½ in., on account of their turbines having high rates of rotation, and being thereby capable of using that vacuum. As the sea water temperature, as already stated, is 55° Fahr., these vacua should be maintained on service.

Line 9 gives the steam consumptions per unit of power, and these should be realised in practice. They are reckoned as per primary horse power in line 3.

The figures 12·71 and 11·86 are typical of modern practice in the types considered for (*a*) and (*b*) respectively. The figures for (*c*) and (*d*) are deduced from (*a*) and (*b*), having regard to the new conditions produced by using superheated steam. The other figures in this line are calculated from trial results of the respective turbines, and the results so found compare very favourably with the steam consumption given for (*b*) when all factors are taken into

[illegible] Thus, selecting design (*f*), the value 10·1 may be obtained from (*d*) by multiplying 11·86 by 0·91, representing the gain due to the superheat, and by further multiplication by 0·96, the increased economy due to higher speeds of rotation, number of units, and increased vacuum. The other figures may be similarly examined with like results.

The steam per hour, line 10, is found from the product of the figures given in lines 9 and 3.

Auxiliary steam consumptions are shown on line 11. They may appear at first sight to be very high, but on examination it is hoped that they will be found correct. In the ships selected a very large amount of steam is used for steering, dynamos, refrigerating machinery, cooking, distilling, and evaporating, apart from that used in the propelling auxiliaries. Further, the number of auxiliaries now usually fitted in a first-class passenger steamer's engine room is large, and include sanitary, bath and fresh water pumps, &c. The steam consumption of all these, therefore, are included with that of the boiler feed, circulating pumps and fan engines, and are entered in line 11. The make-up feed and drainage is also included. To give an idea how all these affect the total consumption the following figures may be of interest for—

Design (*a*). Main engines	12·71
" " auxiliaries	1·27
Hull auxiliaries	·074
Make-up feed and drains	
	14·72

The auxiliary steam consumption for (*a*) and (*b*) may be taken as practically identical. For the remaining designs a moderate degree of superheat is proposed, say 56° Fahr. Design (*c*) uses less steam than (*d*) on account of the smaller condensing plant, slower running fans and feed pumps, and also by the absence of lubricating oil and water service pumps. Designs (*e*) and (*f*) use the same auxiliary steam, the additional steam required by the transformer pumps of (*e*) being balanced by the steam used in the gearing oil pumps and by the increased leakage of (*f*). Design (*g*) is special, on account of having many electrically-driven auxiliaries. The steam consumption stated for the latter is believed to be in excess of that actually used.

In line 12 appears the total consumption of both main and auxiliary engines. This is the total water which must be evaporated per hour by the boilers, and forms the basis of estimate for the coal consumption. The latter is easily derived from the former, and the result is shown on line 13. The calorific value of the coal used is taken at 14,000 British thermal units per lb., the feed temperature at 210° Fahr., and the boiler efficiency as 73 per cent., which is a reasonable figure to attain day in and day out at sea.

Dividing the horse-power figures in line 1 or line 2 into the corresponding figures of line 13 gives the coal consumption per unit of power, as recorded by either indicator diagram or torsionmeter.

Having regard to the type of engines used the figures in each case are normal. Better results are often claimed, but they are generally based either on the consumption for the main engines alone, or that of the main engines and the propelling auxiliaries combined, without any regard being paid to the other auxiliaries and losses already mentioned. It must, of course, be conceded that the hull auxiliaries are independent of the horse-power of the propelling machinery.

Line 15 is interesting, as being a measure of the overall efficiency of the machinery, auxiliaries, and boilers. It also indicates the weight of fuel required per horse-power hour when the calorific value of the fuel used differs from that selected as a basis in this comparison.

The distance run by the ship in nautical miles per ton of fuel burnt is shown in line 16. These figures are very important, and from them the economies in line 17 have been calculated. This is the most just and accurate method of computing economy for such variables as horse-powers, revolutions and steam consumption per primary horse-power are eliminated. It will be observed that any of the alternative schemes are better than the basis design (*a*), and the percentages vary from 5 with direct-driven turbines using saturated steam, to 35 with the turbo-electric drive (*g*).

Particulars of the boilers necessary to ensure the required evaporation in line 12 are given in lines 18 to 21. All are worked under Howden's system of forced draught, with an air pressure of $\frac{7}{10}$ to $\frac{8}{10}$ in. in the ashpit. In those designs having superheaters the Schmidt type is used with the necessary modifications made in the boilers. It may be argued that the boilers are on the small side, but it must be pointed out that they are designed on the basis of the actual water evaporated, and not on the indicated horse-power or shaft horse-power developed.

The total coal consumption in tons per day is given in line 22, and the capacity of the permanent bunkers in line 23. The latter has been computed on the basis of $1\frac{1}{2}$ days reserve coal in each case being stowed in the permanent bunkers. The usual reserve bunkers are, of course, fitted in addition to the permanent bunkers, but need not be further considered, as all the designs have been brought to a common base for purposes of comparison.

The weight of machinery is given in line 24. This includes all items in engine or boiler rooms required for propelling purposes.

To form an estimate of the deadweight gained, the weight of machinery has been added to the weight of bunker coal in each case, and the result in tons appears in line 25. Line 26 is obtained by subtracting the figures in line 25 from the 6,403 tons given for (*a*), and represents the extra deadweight which may be carried per voyage out or home.

The length occupied by the machinery, boilers and necessary cross coal blocks is as stated on line 27, and the saving in this length over (*a*) is indicated in line 28. The shortening of the machinery space and bunkers allows more available space in the ship for cargo. This extra volume in cubic feet has been calculated from the drawings and recorded on line 29.

In this Table, No. II, the important figures are those entered in lines 22, 26 and 29, representing the coal used per day, the gain in deadweight, and in cubic capacity respectively. These are further considered in Table III in respect to the annual savings.

The assumptions made in Table III are shown on lines 1, 2 and 3. For the distance travelled by the ship per annum 69,300 nautical miles have been taken, which is equivalent to 150 days' steaming. The average value of coal and deadweight taken over the lifetime of the ship is 20s. and 14s. per ton respectively. From these the figures in lines 5 to 8 are calculated, with the result that the total annual savings are as shown in line 9.

The cost of the ship is given in line 10, and the gross annual return as in line 11. The latter does not include depreciation or insurance, but includes interest on increased capital expenditure, and also the increase, if any, in cost of maintenance.

The cost has been based on current prices just before the war, *i.e.*, in the first half of 1914.

For the calculation of gross annual return $12\frac{1}{2}$ per cent. has been assumed in (*a*). This is taken from the published balance sheets of several shipping companies. The actual return will be more than that assumed, since only one ship is considered and in practice at least three ships would form a fleet, with a gross annual return of from 14 to 16 per cent.

To obtain the corresponding figures for the other designs the annual savings of line 9 have been added to the gross return of (*a*), and from the totals so found are deducted the annual increase in the cost of maintenance (£900 to £1,500) and also 5 per cent. for interest on the increased capital, except in (*b*), where the costs are the same and the maintenance less than in (*a*).

To determine the years for depreciation, lines 12 to 14 have been calculated. The figures are produced to show in some measure the lifetime of the machinery. It is difficult to calculate the years for depreciation for each type of prime mover, but it may be safely stated that design (*g*) will be an efficient and modern one many years after (*a*) is obsolete, as the probability of a new invention increasing

the efficiency of (*g*) is very much more remote than of one improving (*a*). An attempt to state the years of life is shown in line 15. These figures are extremely important, as the rate of depreciation being decreased from $6\frac{2}{3}$ per cent. of (*a*) to $4\frac{1}{2}$ per cent. of (*g*) means some £3,000 per annum.

Line 16 indicates the number of boiler furnaces in each ship, and is a measure of the labour charges for boiler room complement. The latter saving, in addition to the increase of years for depreciation, and in conjunction with line 11, should make for, in design (*g*), a better return on the capital than in (*a*) or any of the others.

Line 17 shows the net annual return on the cost of ship. These figures are the most important in the Tables. They have been calculated after allowing for the usual deductions from the gross returns in line 11. They also allow for the years of depreciation stated in line 15, which allowance is made subject to actuarial concurrence in same. Seven per cent. is taken for (*a*), and from this figure the other returns have been calculated.

It is hoped that the comparisons made will clearly show that by spending $4\frac{1}{4}$ per cent. more money in the first instance, the net annual return may be increased from 7 per cent. in (*a*) to 15 per cent. in (*g*).

The figures are calculated, as already mentioned, for a specific case, and should, in general, hold for similar cases, and also in some others, subject to the reservations made in Part II.

With regard to the arrangements shown in Plate I, it may be stated that in each case the engine-room space is sufficient to accommodate the necessary auxiliary machinery.

The exact position of the various bulkheads would be modified as required by the naval architect, as also would be the volume of machinery spaces to secure the necessary deduction to make the net tonnage almost identical for the various designs.

Design (*f*) has been drawn for turbines having lower revolutions than those shown in Table III, so that the space occupied should be slightly reduced. The overall length, however, would be as indicated.

An alternative scheme for (*g*) would be to take the turbo-alternators and place them in a compartment distinct from the propelling motors, say between the boiler rooms.

The sectioned portions show the space saved over (*a*); the cubic capacity corresponding to this saving is given in Table II.

Part II.

The selection of a 21,000 h.p. $19\frac{1}{4}$-knot design forms a good point to view the application of the various alternatives to ships having higher or lower powers and revolutions corresponding to the power and speed.

If the lower scale be first considered, machinery types (*b*), (*d*) and (*e*) become more and more inadmissible, as the horse-power and revolutions decrease, on the grounds of extravagance in steam consumption, of excessive weight and abnormal dimensions. Types (*a*) and (*c*) are applicable to the lowest of powers and revolutions. It should be observed that the steam consumptions of these types, considered alone, favourably compare with some of the other designs and that it is the excessive weight that places the piston-type machinery at a disadvantage.

For improved economy in piston engines it would be well to fit drop valves worked with Lentz gear, so that an indicated horse-power could be realised with superheated steam on not more than 9·5 lb. of steam per hour. Marine engines with Lentz valve-gears were fitted to some five steamers built about seven years ago in France, which gave good results on trial. This type of gear has also been fitted to large stationary engines with success. With this improvement fitted, and the adoption of superheaters, the piston engine should receive a new lease of life, although the overall economy as measured in the net annual return would be considerably less than in (*g*).

Types (*f*) and (*g*) are applicable to the lowest powers, with the stated degree of economy maintained and very often improved.

Taking new powers and corresponding revolutions, higher than in the case examined in Part I, types (*a*) and (*c*) fall out of the running very quickly, as the weight of machinery and necessary space become too great.

The remaining designs are all applicable to high powers with even better results than given in Table II. Type (*f*) would, however, require to have four shafts with eight or more turbines for higher powers, on account of the dimensions of gearing, and is, therefore, at a disadvantage over (*e*) or (*g*).

With a view to securing further economy in turbine-driven ships, it is recommended to increase the propeller revolutions to such speeds as would produce slip ratios of from 0·45 to 0·50, provided always that the disc-area ratio of the propellers does not exceed 0·7. The net effect will be to produce machinery which will be small and light, and also decrease the steam consumption, so that a larger number of nautical miles may be run per ton of fuel than in ships having slower-running propellers. The machinery would also decrease in first cost, not per unit of weight, which would, of course, increase, but per unit of power, which is the more important factor. The decrease in fuel used, and the decreased capital cost of the ship in conjunction with the increase in cargo capacity, will result in a commercial success satisfactory to all concerned.

TWIN-SCREW MOTOR OIL TANKER, "HERA."

The oil tank motor vessel *Hera*, general arrangement drawings of which are given on page 444, and illustrations on pages 445–46, is under construction from designs by Mr. Eyvoet of the Dordrecht Shipbuilding Company, Dordrecht, Holland, for the Nederlandsche Indische Tankstoomboot Maatschappij. The propelling machinery consists of two sets of Kromhout marine oil engines constructed at the Kromhout Works, Amsterdam, to the designs of Mr. John Goedkoep.

The dimensions of the *Hera* are :—

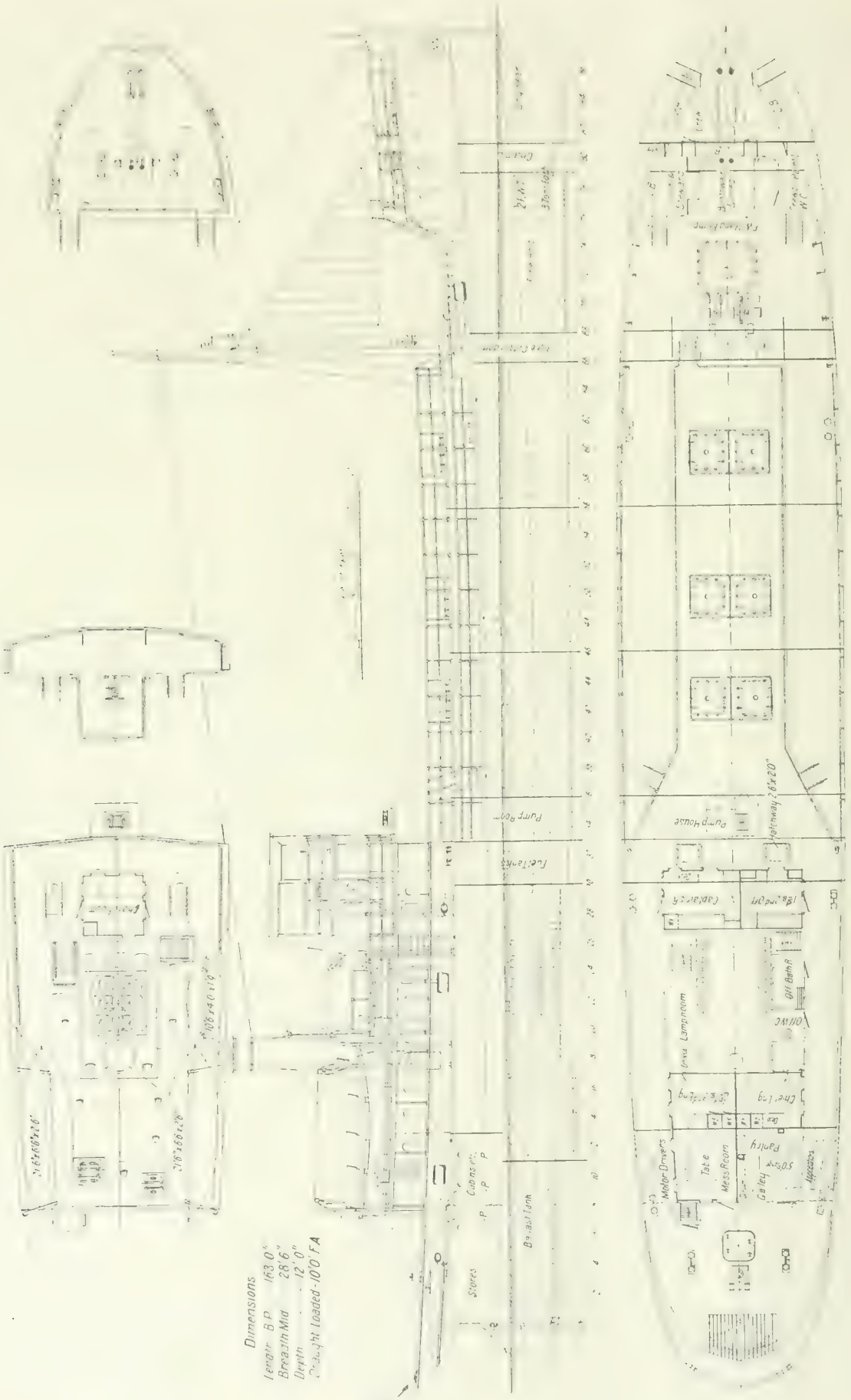
Length, b.p.	163 ft.
Breadth, moulded	28 ft. 6 in.
Depth	12 ft.
Loaded draught	10 ft.
Oil capacity	450 tons in bulk

The main engines are of the latest Kromhout M.P. type, working on the two-cycle system. The fuel feed pumps are driven by a vertical shaft on the forward end of the engine, all four pumps being grouped together round this shaft at a convenient height for their easy manipulation. The pumps are provided with levers for hand injection which is required for first priming the engine with fuel. All four pumps are driven by a single cam, and the revolutions are controlled by a governor which moves the cam on an inclined plane, thus giving more or less stroke to the fuel feed pumps as may be required. Each engine is controlled from the after end, the engines being reversed by compressed air.

Reference to the illustration on page 446 will show a hand wheel which operates the clutch, and on the rear cylinder will be seen a small handle working in a quadrant which operates the cam shaft which works the air starting valves. Below the air control lever is a horizontal lever which controls the fuel supply.

The cam shaft is provided with double cams per cylinder, one for "ahead" and one for "astern," and a feature of the design is that with the air control lever in the middle position, the cams do not come in contact with the rollers of the rocker arms.

The engines start up in any position on the admission of air, and as the pumps immediately commence injecting fuel the quantity of air used is small. If it is required to start the engine "ahead," the air control level is pushed to the forward end of its quadrant and held there till the engine commences revolving. Directly the engine is running the air control lever is put in the middle position and the engine is running on fuel. The

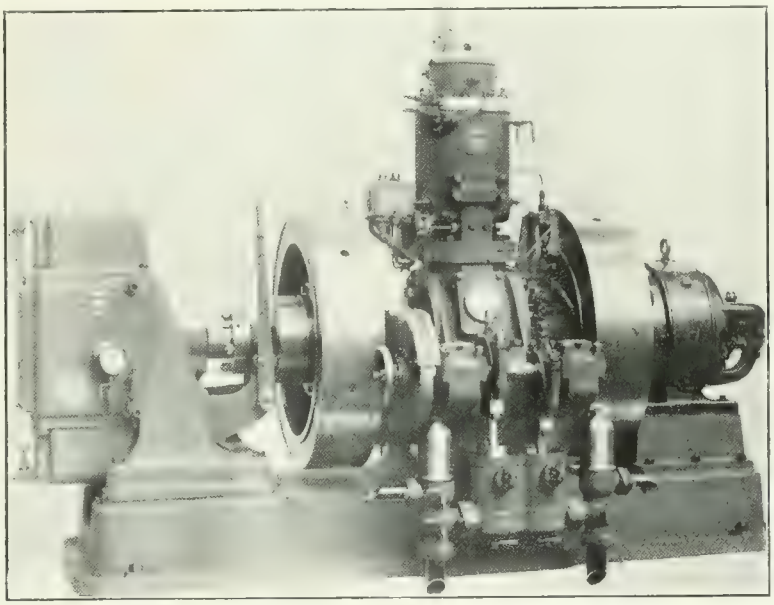


Twin Screw Motor Oil Tanker "Hera," built by and engined with two sets of Kromhout M.P. Type Marine Oil Engines.

time taken is about five seconds. The clutch is then engaged if the propeller is required.

If the bridge rings down "stop," the clutch is simply disengaged, the engine remaining running at dead low revolutions on the governor. If "ahead" is again asked for, the clutch is re-engaged, but if "astern" is demanded the air control lever is pulled backwards in the quadrant; the result is the engine slows down owing to the admission of compressed air on the up-stroke of each piston and starts to rotate in the opposite direction directly the air pressure has overcome the flywheel momentum, so that the reversing is beautifully cushioned. When the engine is running in the reverse direction the clutch is re-engaged.

It will be seen, therefore, that the whole engine is controlled by means of the clutch wheel, the air control lever, and the fuel control lever. The clutch wheel is also connected to the governor, so that when the propeller is working the governor is prevented from cutting down the revolutions below the normal full load speed.



Kromhout Auxiliary Engine for Electric Lighting and Auxiliary Pumping.

The heads of the engines are entirely water-cooled except for an ordinary cylinder cover, which is first heated by blow lamps before the engine is started. Once started, the vaporising device inside the water cooled heads remains at the required temperature irrespective of the number of revolutions, and there is no tendency for the engines to cool down even if they run for long periods at dead low revolutions on no load.

As soon as the engine is running and the blow lamps are put out, the cylinder cover cools down. No visible part of the engine heats to "cherry" red, and the blow lamps are not again required, except for starting after the engine has been stopped for some hours. No water injection is used at all under any load, and no compressed air is used in connection with the injection of fuel, excepting for reversing.

The lubrication is by means of force feed pumps which deliver oil to the cylinders, gudgeon pins, big ends and main bearings. The lubrication is automatic, the lubricators being provided with adjustable sight feeds to each point. The thrust blocks are lubricated by means of wicks from a large reservoir, and as they are provided with ball bearings for both the "ahead" and "astern" thrust, they require practically no attention.

The scavenging air required when the engine is running is drawn in through the crankcase air valves on the up-stroke of the piston and compressed in the crankcase in the usual manner on the down-stroke of the piston, the air valves being of the spring loaded disc type of special design.

The engines exhaust into two large water-cooled silencers, the exhaust gases ultimately combining in one up-take and discharging up a funnel.

In addition to the two main engines, an auxiliary engine of the same type, illustrated on this page is provided. This auxiliary drives a dynamo one end for electric lighting the ship, and an air compressor the other end for providing the compressed air for starting and reversing the engines, and for blowing the whistle.

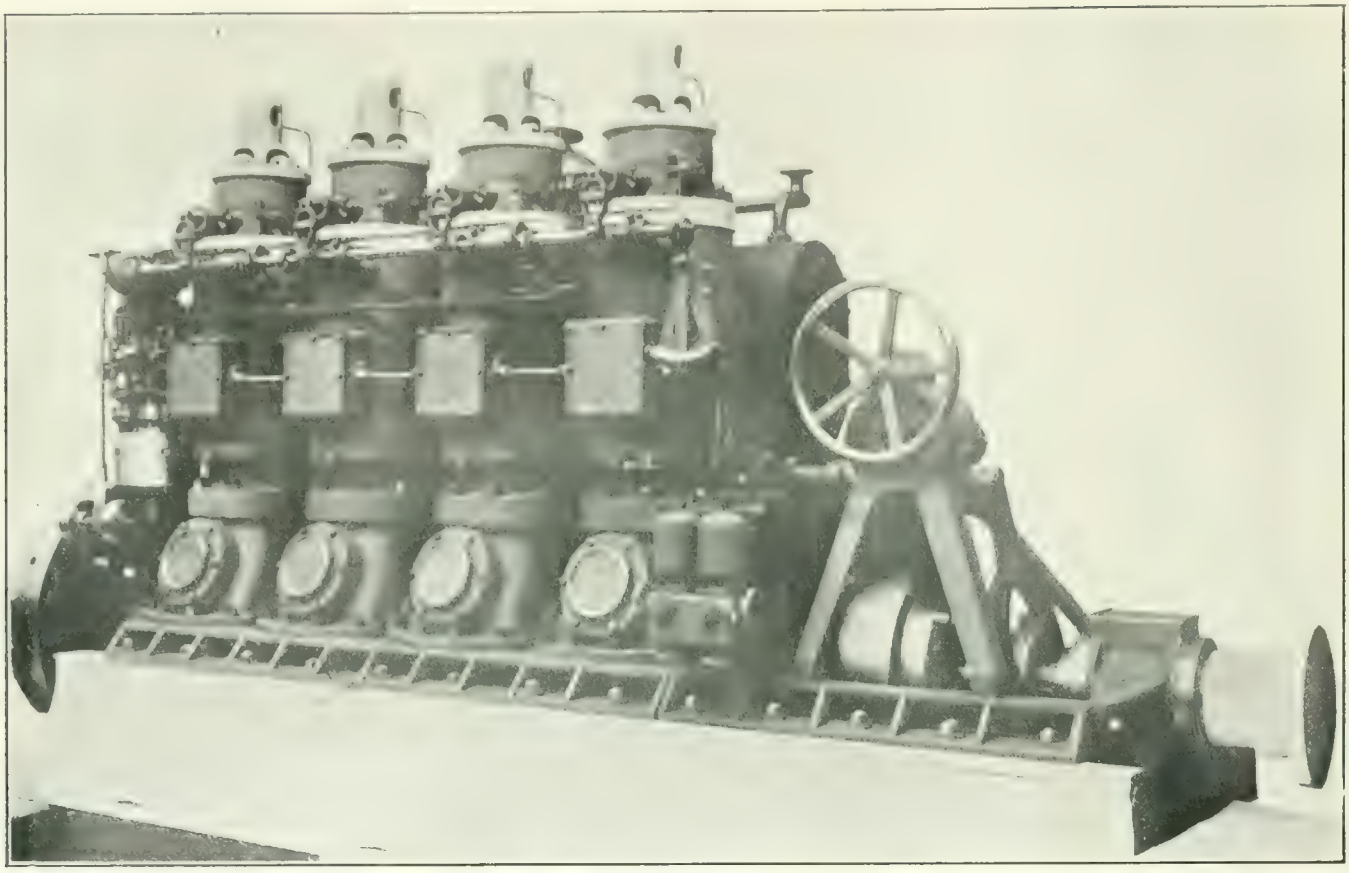
To the auxiliary engine are also coupled two stand-by pumps, one for dealing with the bilge suctions and the other for the circulating water of one or both of the main engines should necessity arise, each main engine being provided with its own circulating pump in duplicate.

In addition to the engines, a donkey boiler, oil fired on the Meyer system, is placed in the after end of the engine room, the steam generated by this boiler being utilised to work an auxiliary set of bilge pumps and to work the cargo discharge pump, which is placed in the cofferdam at the after end of the cargo hold. This boiler also provides steam for the anchor windlass, the cargo winch on the fore deck, and a capstan on the after deck, and also for steam heating the accommodation.

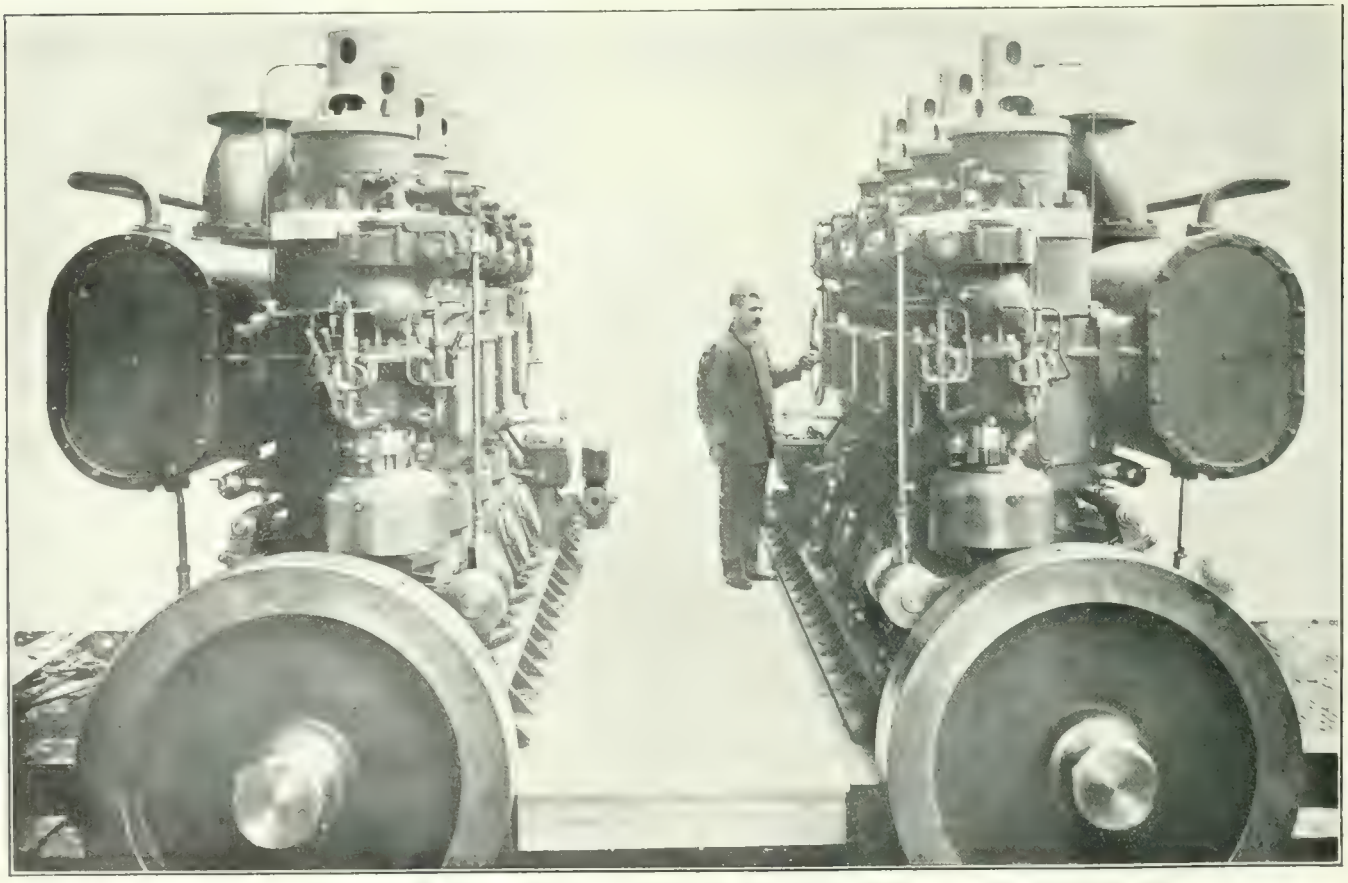
Twin-Screw Motor Oil Tanker "Hera.

The trial trip of the *Hera* is expected to take place shortly, after which the vessel will trade at least for some time on the British coast, and may ultimately make a passage out to the Dutch East Indies.

The engines were not run in the normal manner on the test bench before being erected in the ship, but the horse power during the trial trip will be ascertained by means of indicator gear.



One of the two Kromhout M.P. Type Marine Oil Engines on the "Hera."



View of the Main Engines of the Oil Tanker "Hera." (*See page* 443.)

DOCK AND HARBOUR EQUIPMENT.

CRANES AND TRANSPORTERS FOR THE DOUBLE DUTY OF LOADING AND DISCHARGING COAL.

III.

In preceding articles* we discussed the uses of the Temperley and Bridge types of transporters and also the principle of employing cranes in conjunction with transporters.

The following is an example where quick working balanced electric luffing cranes are used for discharging coal. The grabs used have a capacity of 2 tons, and are of Priestman make, bridles being attached to overcome twisting.

It will be seen from the illustrations that the installation consists of four cranes mounted on travelling pedestals. The

Installation of Quick Working Luffing Cranes, fitted with "Priestman" Grabs, at one of R. & J. Rea's Coaling Jetties.

jetty on which the cranes work allows the barges to be on the land-side and the ships to be discharged lie on the far side of the jetty.

The cranes have four motions, viz., lifting, derricking, slewing and travelling, and in order to ensure quick working and economy in electrical consumption, the load is balanced by means of balance weights which run in a special steel frame fixed at the back of the crane. The balancing is not effected directly from the grab, but from the lifting barrel, and by this means the weight is not taken off the grab, the whole being available for digging.

The working conditions allow of the coal being grabbed, lifted, slewed, derricked, lowered and discharged, and the grab lifted, slewed back, and lowered to its original position at an average rate of 60 cycles per hour. The maximum radius of the cranes is 50 ft., variable to 22 ft., the maximum height of lift from rail level being 56 ft.

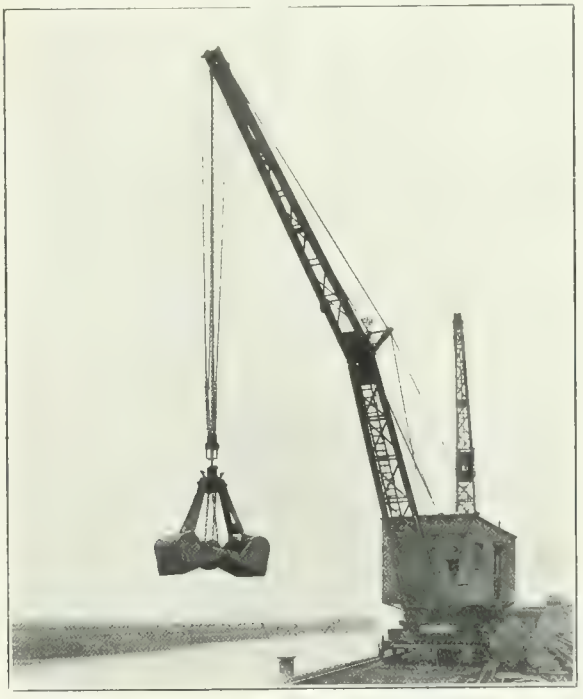
The electric crane shown in the next column is of the travelling dockside type, with a fixed radius of 43 ft., running on a gauge of 12 ft., and capable of lifting 4-ton loads. The crane has lifting, slewing and travelling motions, and separate motors for each motion, working on a three-phase current of 440 volts, 40 cycles.

The speeds are as follows :—

Lifting	4 tons . .	150 ft. per minute.
Slewing ..	4 ,, . ..	40 ft. per minute at hook.
Travelling .	4 ,, .	40 ft. per minute.

This crane has a tall jib, and is designed to unload from ships, barges, &c., or load into ships, barges, &c., out of wagons or stock heaps. It is fitted with a Peter's patent grab bucket, which possesses up-to-date and novel features, briefly stated as follows :—Simplicity and lightness of design, combined with great strength. Enormous closing power for dealing with stubborn substances, with an exceedingly short travel of main closing chain, so that it can be worked in the minimum of space. Also great speed of working can be obtained.

These grabs are made of single chain, or double, treble, or quadruple



Portable Electric Dockside Coaling Crane with "Peters" High Purchase Grab.

chain or rope type, and can be worked on a transporter or telpherage system. The 4-ton crane shown can work a coal grab weighing $1\frac{3}{4}$ tons, capable of lifting $1\frac{3}{4}$ tons of coal, and doing an average duty of between 50 and 60 cycles per hour. The crane and grab were manufactured by Stothert & Pitt, Ltd., Bath.

The duty to be performed on another occasion was the unloading of coal from barges brought alongside the quay, and the delivery of same into chutes *at a fixed height*. The grab used is a Hones, and the opening ring is set at a given height, which enables the grab to be opened exactly over the chutes. It has also gearing to open at varying heights if desired.

The crane is of the electric locomotive type, running on a gauge of 4 ft. $8\frac{1}{2}$ in., and suitable for lifting a gross load (grab and coal) of 2 tons at a speed of 100 ft. per min. The motions of hoisting and travelling are worked by one motor, and separate motors are fitted for derricking and slewing.

The maximum radius of the crane is 40 ft., the minimum 14 ft., and the derricking motion is so arranged that the jib can be raised and lowered with full load.

* *Shipbuilding and Shipping Record*, November 4, 1915, pp. 397–98, and November 11, 1915, pp. 419–20.

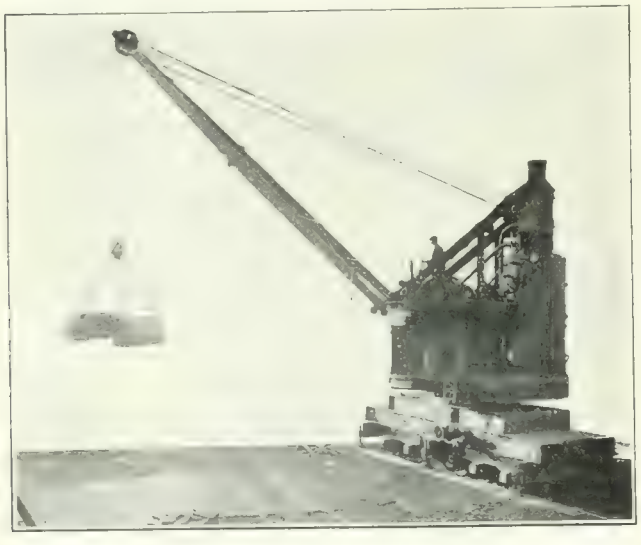
The crane and grab and the position of the chutes are clearly indicated in the illustration.

The work to be performed in the next example was quite different from the foregoing cases, inasmuch as the crane is of the permanent-way type, to be suitable for work with ordinary rolling-stock, and

Electric Locomotive Crane and Single Chain Grab.

the undercarriage is fitted with buffer beams, spring buffers, draw hooks, &c.

The crane is designed for rapidly handling coal from collier or stack into trucks, and it is interesting to note that the crane under carriage is fitted with two warping drums (one at each side) for



Special Steam Locomotive Crane with Permanent-way Fittings and Priestman Grab.

moving the coal trucks to and from the crane during coaling operations. These drums, with their gearing, are capable of hauling loaded trucks of 30 tons at about 4 miles per hour.

The crane is capable of handling a normal working load of about 5 tons, consisting of a Priestman double-rope grab suitable for lifting 80 cubic ft. of coal, and the grab is fitted with bridle to prevent spinning.

The leading dimensions are as follows:—

Radius, variable from 12 to 18 ft.
Clear height from rail level to underside of grab when at maximum radius, 25 ft.
Height of lift below rail level when at 18 ft. radius, 10 ft.
Gauge of rails, 4 ft. 8½ in.

Steam engines for driving, revolving, jib adjusting, and propelling have cylinders 11 by 14 in.

The whole crane is mounted on 12 steel-tyred travelling wheels six on each side, with two pairs of the outer wheels arranged on swivelling bogies so that it can travel around rail curves of about 100 ft. radius.

All the levers for controlling the various motions of the crane are placed at one side within easy reach of the driver, who is placed in an elevated position so as to have an uninterrupted view of his work.

An installation of this description is eminently suited for railway work, and the crane is illustrated herewith. Like the preceding example, it was constructed by T. Smith & Son, Ltd., Rodley, Leeds.

The foregoing examples are typical of modern practice in this country and abroad, and it must be borne in mind that there will be a steadily increasing demand for mechanical appliances of this nature chiefly because of the difficulty of obtaining a steady supply of labour, and more particularly because of the great saving effected in the cost of handling.

In many cases within the writer's knowledge, where the cost of getting coal, chiefly by human labour, ex steamer, into storage, has been from 1s. to 1s. 6d. per ton (and in some cases 2s. per ton), this has been reduced when using a grab and mechanical appliances to from 2d. to 4d. per ton, including cost of trimming, operating, weighing and power necessary. Without the cost of trimming this is reduced to 1d. or 1¼d. per ton. No allowance is, however, made for depreciation, or interest on capital invested in the machinery.

The writer has not dealt with machinery used solely for loading coal, nor with telphers or conveyors, and while it is hardly necessary to add that other well-known firms, besides those mentioned, make transporters and cranes for the dual duty of loading and discharging, the machinery for operating same varying in essential features, *au fond* the types remain the same.

H. HUBERT.

New York's Foreign Commerce.—The leasing of the American Dock Company's new 1,000-ft. pier at Tompkinsville, which was recently completed by Norton, Lilly & Co., foreshadows a greater development of the east shore of Staten Island for terminal facilities, which locality possesses many natural advantages that do not obtain elsewhere in the port of New York. Norton, Lilly & Co. already occupy three large piers at South Brooklyn, and are despatching steamers to practically all ports of the world. The recent growth of the port of New York's foreign commerce has been largely due to war conditions abroad, but all present indications point to a much larger volume of business after the war; in fact, preparations are now being made in many quarters to cope with these new conditions. The great difficulty at present is how to meet and provide suitable harbour facilities for the increased business. This question is giving much concern to those interested in the shipping and kindred business. It is not an uncommon occurrence at the present time for steamers to anchor in the lower bay for days, awaiting facilities to either discharge or load cargoes. Delays of this character are extremely burdensome, and while borne by the shipowners and charterers they are ultimately paid by the merchants, manufacturers and shippers in the form of increased freight rates to offset cost of operation. There are practically no wharf facilities available for any new or contemplative steamship business, nor are there any new developments under way except the three city piers which are now being built in South Brooklyn, all of which have been leased.

GENERAL NEWS SECTION.

PERSONAL.

At the request of the Admiralty, the Dublin Port and Docks Board have agreed to keep open the post of Assistant Harbour Master till the end of the war. Lieut. Louis Brady, R.N.R., was appointed to the position last month.

Mr. J. H. Cory, director of J. Cory & Sons and Cory's Trading Company, Cardiff, was the only person nominated as the successor to the late Lord Ninian Crichton Stuart, M.P. for Cardiff, and was, therefore, returned unopposed.

Mr. F. C. Gardiner (James Gardiner & Co., shipowners, Glasgow) has been made a member of the Government Transport Committee, and is devoting the whole of his time to the work of the Committee in London. Mr. Gardiner is President-elect of the Chamber of Shipping.

The Board of Trade have awarded a piece of plate to Mr. Bernt F. Enes, master of the Norwegian steamship *Havtor*, of Haugesund, in recognition of his services to the shipwrecked crew of the steamship *Windsor*, of London, whom he rescued in the North Atlantic Ocean on August 21.

At a meeting of the Executive Board of the Shipbuilding Employers' Federation held in Edinburgh on Wednesday last week, Mr. G. J. Carter, Managing Director of Cammell Laird & Co., Ltd., Birkenhead, was elected President. Mr. W. H. Dugdale, of S. P. Austin & Son, Ltd., and Mr. Noel E. Peck, of Barclay, Curle & Co., Ltd., were elected Vice-Presidents.

Mr. H. B. Roper, Manager of the Leyland Line, has presented, on behalf of the Lords Commissioners of the Admiralty, gold watches to the officers of the steamer *Armenian*, which was torpedoed and sunk by a German submarine on June 28. Among the recipients were Mr. John Crighton, chief engineer, who was wounded, Mr. E. G. Pass (chief officer), and Mr. T. J. Lewis (second engineer).

It is noteworthy that among the gentlemen nominated to service as High Sheriffs for the counties bordering on the Mersey are the following, connected with Liverpool Shipping:—Cheshire, Sir Percy E. Bates, Bart., and Mr. T. Royden, both directors of the Cunard Company; Anglesea, Mr. H. M. Grayson, senior of H. & C. Grayson, Ltd.; and Flintshire, Mr. Harold W. Davey, son of the late Mr. Davey, who was a partner with the late Sir Alfred L. Jones, K.C.M.G.

Mr. Robert S. Cripps has been appointed Secretary and General Manager of the Port of Londonderry, by the Londonderry Harbour Commissioners, in succession to Mr. Jas. Dawson, superannuated. Mr. Cripps has been 26 years with the Mersey Port and Docks Board, Liverpool, and occupies a position as Chief Assistant. For the past two years he has been in charge of a committee appointed to consider the question of extending the trade of the port of Liverpool. He enters on his new post on December 1.

The opportunity will be present next month when those who have been complaining about the firm attitude of the Mersey Docks Board in requiring a speedy movement of traffic from the quays to prevent congestion again arising, may make a bid for the six vacancies on the Board that will then take place. It is hardly likely that if they have any ambition to displace the retiring members, they will have the courage to face the dock electors on this ground. The members retiring are Sir Helenus R. Robertson (chairman), Messrs. J. U. Hodgson, R. D. Holt, W. M. Moss, E. V. Rayner and T. Rome. All are eligible for re-election, and the date fixed for nominations is December 13.

GOVERNMENT CONTROL OF TONNAGE.

We take the following extracts from the two Orders in Council published on November 10, under which the Board of Trade is empowered to commandeer British ships for the carriage of "foodstuffs and of any other articles of commerce," and also under which British ships desirous of trading between foreign ports must be licensed by the Board of Trade:—

Requisition of Ships.

Whereas it has been made to appear to His Majesty that it is essential to the defence and protection of the realm that all British ships registered in the United Kingdom should be made liable to requisition in manner hereinafter appearing for the carriage of foodstuffs and of any other articles of commerce:

Now, therefore, His Majesty is pleased, by and with the advice of his Privy Council, and in exercise of his prerogatives as aforesaid and of all other powers him thereunto enabling, to order, and it is hereby ordered, that any British ship registered in the United Kingdom may until further order be requisitioned by and on behalf of His Majesty for the carriage of foodstuffs and of any other articles of commerce, and such requisition is to take effect upon notice of requisition being served as hereinafter provided on the owner of any such ship:

And His Majesty is further pleased, by and with the advice aforesaid, to authorise and direct the President of the Board of Trade to give effect to this Order by causing notice of requisition to be served on the owner of any such ship:

And His Majesty is further pleased, by and with the advice aforesaid, to declare that service of notice of requisition on an owner shall be deemed sufficient and effective if served in the case of an individual owner by being addressed to such individual owner and left at his last-known place of business or abode, and in the case of joint owners by being addressed to such joint owners and left at the last-known business addresses or places of abode of such joint owners, and in the case of a company or corporation by being addressed to such company or corporation and left at the registered or other address of such company or corporation, or in any of the aforesaid cases by being addressed to the managing owner, ship's husband, or other the person to whom the management of the ship is by law entrusted by or on behalf of the owners, and left at the registered or other last-known address or place of abode of such managing owner, ship's husband, or other such person, as the case may be:

And His Majesty is further pleased, by and with the advice aforesaid, to declare that any notice of requisition which the President of the Board of Trade may cause to be served hereunder, may be signed by any person or persons from time to time authorised for such purpose either generally or specially by the President of the Board of Trade.

British Vessels Trading between Foreign Ports.

From and after December 1, 1915, no British steamship registered in the United Kingdom exceeding 500 tons gross tonnage shall carry any cargo from any foreign port to any other foreign port—and whether or not such ship while carrying such cargo calls at any intermediate port within His Majesty's Dominions—unless the owner or charterer of such steamship has been granted exemption by licence as hereinafter provided.

And His Majesty doth hereby declare that the expression "foreign port" herein used shall mean and include any port outside His Majesty's Dominions.

And His Majesty, by and with the advice aforesaid, and in exercise of his prerogatives and powers as aforesaid, is further pleased to authorise and direct the President of the Board of Trade to appoint a committee of persons to carry out and give effect to the provisions hereof, and that the said committee shall have power to grant licences of exemption therefrom to or in favour of owners and charterers of such steamships as aforesaid, which licences may be general in reference to classes of ships or their voyages or special.

FROM OUR CORRESPONDENTS.

CLYDE AND DISTRICT.

(From Our Own Correspondent.)

Glasgow.

The only mercantile vessel launched on the Clyde last week was the *Clyde Trader*, which Ferguson Bros. have built for the Clyde Shipping Company. This vessel, when complete, will be the most powerful tug employed on the river. Ferguson Bros. have another vessel of the same description on hand for the same owners, and this second tug is also ready for launching. Another vessel which is approaching the launching stage is a large oil tank steamer which the Greenock & Grangemouth Company have built at their Greenock yard. At Alloa, on the Forth, A. Jeffrey & Co. have launched a steamer of 120 ft. in length for Howden Bros., Larne. This is the first of five similar vessels which the builders have on hand for the Larne firm.

GLASGOW DOCKERS' DEMANDS.

The dock labourers at Glasgow have, through their union, put forward new demands for increased rates of pay. The present agreement between the Scottish Union of Dock Labourers and the shipowners and stevedores of the port terminates on December 31, and in view of this fact a programme of the men's demands has been drawn up. The men ask for increased payment for day, and night work, and also for the discharge of certain kinds of cargo which is classed as "dirty" work. Up till the present, work at the docks has proceeded much more smoothly at Glasgow than at almost any other port in the kingdom.

CLYDE REPAIR WORK.

Repair work is brisker at Glasgow this week than it has been for some time, there being nearly a dozen vessels in the hands of repairers. Among the number are two Park Line steamers, the *Adda Park* and the *Kosbeam Park*. Two large French sailing vessels which are engaged in nickel ore carrying trade from New Caledonia are also being overhauled on the Clyde at present before sailing again for the South Pacific. Perhaps the most interesting repair job in progress, however, is that which the Clyde Shipbuilding & Engineering Company are carrying out at Port Glasgow. The vessel on which they are engaged is being entirely transformed, and it is understood that she is being converted into a floating workshop. The internal fittings have been for most part removed and new fittings and subdivisions have been installed. It is expected that the work will occupy several months yet.

MERSEY SHIPPING AND SHIPBUILDING.

(From Our Own Correspondent.)

Liverpool.

Liverpool shipowners are examining closely the Government proposal for the control of shipping, and while they would be glad to be left free to fix their ships on any market, they are ready to fall in with the scheme if the issuing of licences will accomplish the object in view, and not seriously disturb business connections that have been built up by established regular trading lines. It seems to be understood that the Ship Licensing Committee will more particularly direct their attention to tramp tonnage which, constantly trading between neutral countries, only make for home ports to effect renewals and repairs.

The Mersey Docks and Harbour Board have just decided, subject to the approval of the Board of Trade, to recoup the pilots for the reduction in their earnings caused by the operation of the orders of the naval and military authorities in connection with the war. For any detention arising out of the war they will be entitled to charge £1 for a vessel under 1,500 tons net register, £1 10s. for a vessel between 1,500 and 3,000 tons, and £2 for a vessel exceeding 3,000 tons net register.

ABSENCE OF GREEK FIXTURES.

A noticeable feature in the sailings announcements of Liverpool lines trading to the Mediterranean just now is the absence of fixtures to any of the Greek ports. Direct services for the time being have been suspended by the five principal lines engaged in this trade, namely, the Cunard Company, Moss Line, Ellerman Line, Papayanni Line and the Prince Line. To Italian, Egyptian and North African ports there is, on the other hand, an excess of cargo and steamers are leaving unable to take all that is offering.

SOUTH WALES NOTES.

(From Our Own Correspondent.)

Cardiff.

The Swansea Corporation Finance Committee and representatives of the Swansea Harbour Trust have concluded their negotiations for the loan of a sum up to £150,000 by the latter to the former under a guarantee which was mutually arranged on the opening of the new King's Dock in 1909. The council of the corporation will be recommended to advance the Trust £65,000 and such further sums up to £150,000 as may be required. The Harbour Trust will repay the money with interest to the corporation and bear the cost which the corporation will incur in borrowing the money.

At a meeting of the Newport Harbour Board last week it was announced that the revenue for October last showed a decrease of £195 14s. 11d., compared with the same month in 1914. The Harbour Improvement and Parliament Committee, it was stated, had dealt with the claim of the Government for exemption from dock and harbour dues. As the result of the Government's refusal to pay these charges for vessels in the river, the Commissioners have suffered a loss of about £1,200. It was decided that Lord Tredegar, Mr. F. P. Robjent, Mr. T. H. Mordey, and Mr. Lewis Haslam, M.P., should put the matter before the Prime Minister.

OCTOBER DRY-DOCKINGS.

Fewer vessels were dry-docked in South Wales during the past month than in any month in the present year. Their gross tonnage was, however, approximately 8,000 tons higher than the bottom level touched this year. Altogether 148 vessels of 377,790 tons were dry-docked last month, against 171 of 519,777 tons in October, 1914, a decline of 23 vessels of 141,937 gross tons. Each port, with the exception of Newport, shared in the retrograde movement. Work in the dry docks last month, though not so active as in past months, was by no means so slack as the figures would indicate, for several particularly heavy "jobs" were dealt with. Figures for each port are as follows :—

	October, 1914.		October, 1915.	
Port.	Vessels.	Gross Tons.	Vessels.	Gross Tons.
Cardiff	98	279,536	75	187,968
Swansea ...	17	31,267	13	33,613
Newport ...	15	15,332	26	50,784
Barry ...	40	139,894	32	102,148
Port Talbot ...	6	23,748	2	3,277
South Wales ...	171	519,777	148	377,790

SHIP REPAIRING.

Conditions in the ship-repairing yards have not undergone any appreciable alteration. A fair amount of work is in hand and employers' chief difficulty is to obtain sufficient labour to meet their needs. The Bute Shipbuilding & Engineering Company, Ltd., have straightened the rudder-post of the steamer *Roumanian*, and are now engaged with general repairs to the steamers *Loppersum* and *Isabelle*. The Cardiff Channel Dry Docks & Pontoon Company are still busy with heavy damage and internal repairs on the Newcastle steamer *Neebing*, bottom damage to the Sunderland steamer *Lord Stewart*, and general repairs to the steamers *King Idwal* and *Marsden*. T. Diamond & Co. are putting the Liverpool steamer *Reynolds* through Lloyd's special survey and continuing heavy stem damage repairs to the Cardiff Hall Line steamer *Cardiff Hall*. The Mercantile Pontoon Company, Ltd., are renewing a number of bottom plates on the Newcastle steamer *Pontop*, while Elliot & Jeffery are about completing an overhaul, which has taken over two months, of the Greek steamer *Grigorios Anghelatos*, besides general repairs to the steamers *Glynn*, *Priconissos*, *Stagpool*, *Tantallon* and *Woolston*. John Shearman & Co., Ltd., are working on 24 steamers at Cardiff, Barry and Newport, including a heavy overhaul of the Glasgow steamer *Mary Park*, bottom damage to the Norwegian steamer *Glena* and the Cardiff steamer *South Pacific*, besides general work on the steamers *Leopold II*, *Parana*, *Seresia*, *Murcia*, *Wooda* and *Etolia*. C. H. Bailey are giving the London steamer *Uranium* an extensive overhaul at Barry, besides effecting damage repairs to the Liverpool steamer *Dalecrest* and the steamer *Milly*. They are also carrying out general repairs on the steamers *Zurbaran*, *Mordenwood*, *Heathmore*, *Gemma*, *Katie*, *Export*, *Yanzin*, *Jial*, *Harlsonwood*, *Jet*, *Egypte*, *Highland Watch*, *Jaffa* and *Boukadra*. At Newport they are giving the Khedivial Mail Steamship Company's steamer *Benha* a general overhaul and effecting general repairs to the steamers *Orkmere*, *Ethel*, *Armonia*, *Ribera*, *Leeds City*, *Opuenda*, *Dardanus*

Castleton, *Panama* and *Newstead*. Altogether C. H. Bailey are working on 28 vessels at Newport and Barry. Moudey, Carney & Co., Newport, are overhauling the Italian steamer *Partecipation* and the steamer *Euphrates*, besides fitting a couple of masts on the Dutch steamer *Hercules* and sundry repairs to the steamers *Hinemoa* and *Seirstad*. The Barry Graving Dock & Engineering Company, Ltd., are carrying out general and damage repairs to the steamers *Stefania*, *Arlington Court* and *John H. Barry*.

THE COAL MARKETS.

(From Our Own Correspondents.)

Although there is a better undertone in the South Wales coal market, there is not much indication of general improvement. At the opening of the present week the tonnage position was about the same as some few days before, the number of vessels putting to sea over the week-end about balancing incoming ships for coal loading. A good number of steamers which have been fixed to load have been held up by heavy weather, and the non-arrival of these boats has in some measure been responsible for collieries being idle on Monday last. For large coals, values at the beginning of the week were practically the same as those ruling last week, but, in regard to forward shipment there are indications pointing to higher prices. There is no perceptible change in smalls. Patent fuel shows no alteration in value. Representative nominal quotations are :—Second Cardiff large coal, 18s. to 19s. ; ordinary large steam, 17s. 6d. to 18s. ; best drys, 23s. to 24s. ; ordinary drys, 20s. to 22s. ; best Monmouthshire Black Veins, 18s. to 19s. ; best Eastern Valleys, 17s. to 17s. 6d. ; and best small steams, 10s. 8d. to 11s. 6d.

North-East Coast.

The recent burst of bad weather has had the same effect on the North-East Coast as at the South Wales ports, and the late arrival of vessels in the Tyne is likely to disturb the position for near loading. For best steams, 19s. 6d. to 20s. continues to be quoted, whilst at 19s. 6d. Tyne primes are firmly held. There is a freer offering of steam smalls, which can be purchased at 10s. 10½d. for Blyths, 13s. 4½d. for Tyne primes, and 10s. 9d. for seconds. At the opening of the week the outlook for loading turns in the Durham market was hardly satisfactory.

The Thames.

The recent spell of inclement weather has operated to expand the demand for house coals. There was a fair attendance of buyers on 'Change on Monday, and the inquiry in regard to replenishing or augmenting stocks was good. There was, however, a limited offering of rail-borne household coals. In some instances the inability of sellers to guarantee despatch at a sufficiently early date tended to handicap business. On the whole the tone of the market is generally firm.

Scottish Markets.

General firmness of tone has prevailed in the various branches of the coal market. At 18s. 6d. named ells have been steady, although, through middle hands, an odd parcel or so could be arranged at something below this figure. There is a heavy commitment for prime quality splints and very little of this grade is now to be obtained for shipment during November. A steady tone has marked Navigations, the value of which at the close of last week was about 21s. Steams have been in plentiful supply, with a fair demand. First-class Fifeshire steams have been well sought after, and in the loading of these there has been a certain amount of delay. Recent approximate quotations for the West of Scotland are :—Ell (best brands), 18s. 3d. to 18s. 6d. ; ell (ordinary), 17s. 6d. to 18s. ; splint (best brands), 23s. to 24s. ; splint (ordinary), 18s. 6d. to 19s. ; navigation, 19s. to 21s. 6d. In the Fifeshire section, the following are approximate figures :—Screened navigation, 23s. to 24s. ; unscreened navigation, 21s. to 22s. ; first-class steam, 18s. 6d. to 19s. 6d. ; third-class steam, 14s. to 14s. 6d. Quotations for Lothians include :—Best steams, 18s. to 18s. 6d. ; ordinary steams, 16s. to 16s. 9d.

Position at Genoa.

The opinion, generally held, that by the close of November there would be an end of the congestion in the coal port of Genoa is hardly likely to be realised. Heavy weather has tended to retard w rk, and it is now quite possible that the congestion will drag on into December.

THE FREIGHT MARKETS.

(From Our Own Correspondents.)

London.

Firmness continues to be the prevailing characteristic of the various sections of the freight market, and the view prevails that further increases in freight rates will take place in one or two special trades. Thanks to the recent Order in Council, neutral tonnage is likely to secure very high rates of freight owing to the restrictions placed upon British vessels. For United States business the steamer *Tiverton*, 26,000 quarters, 10 per cent., has been taken up for December-January loading, at 13s. to the Bristol Channel, 13s. 3d. Irish ports, and 13s. 6d. East Coast of the United Kingdom. From the States to West Italy, 15s. 9d. has been conceded to the *Attualita*, a 33,000-quarter, 10 per cent. boat. Early this week prompt tonnage for this business was worth 17s. For timber from the Gulf to Rosario, 30s. was the quotation, whilst some fancy figures were to be secured by vessels offering for timber business from the Gulf to Mediterranean ports. Homeward from Karachi and Bombay business has been done at 80s. to Hull on deadweight basis. The same figure would be paid to United Kingdom ports for ore. For grain home from Australia on Government account the rate remains at 95s. to the United Kingdom and 97s. 6d. to French ports. The Mediterranean market for ore business has been steady and, from the shipowners' point of view, it is satisfactory to note that charterers are showing some evidence of inclination to agree to the higher rates of demurrage, and guarantees for quicker loading and unloading. For ore from Huelva to the United States the steamer *Polvarth* has been closed at 15s. Seville has taken up, at 24s., a 2,000-tonner to Rouen. In time chartering 20s. can be obtained for 12 months' transatlantic trading. In the Plate section steadiness prevails, and the feeling is that there will be some revival of chartering from this district not long hence. Outward chartering for coal from the Tyne continues to show a high level of rates, and 50s. to Genoa has been refused by owners. In the Bay trade rates now range from 30s. to 32s. 6d., according to port. For the French Channel ports handy-sized boats are none too plentiful, and rates remain very firm on the basis of 21s. Rouen, Havre or Dunkirk. London is worth 14s., or possibly a little more. Recent fixtures include :—Lisbon, 29s. ; St. Nazaire, 30s. ; and Dunkirk, 21s. Cardiff reports a quiet but firm freight mraket. Representative figures are :—Alexandria, 50s. 6d. ; Rouen, 19s. 3d. ; and Genoa–Savona–Spezia–Leghorn, 49s. 6d. Newport to River Plate has paid 39s. From Swansea to Barcelona, the *Patria* has been taken up at 40s., and from Port Talbot to Rouen 19s. 6d. has been paid for the *Ellida*. Glasgow to Genoa has been done at 50s., and from Manchester 45s. has been paid to Cette.

Glasgow.

The scarcity of tonnage was again responsible for the restricted amount of business done on the Glasgow market since our last report. Homeward business was specially difficult to transact, chiefly on account of the new Government regulations, which were not at first clearly defined. Chartering in the American trade was mainly confined to grain freights to the United Kingdom and France. Rates continued strong, and 16s. 3d. was paid for grain to Italy. Oats to London were quoted at 10s. 6d. per quarter. In the River Plate trade a short supply of boats kept rates firm, 87s. 6d. being offered for early loading. Time charter business was freely quoted at 20s. to 21s. for transatlantic trading. The Eastern markets were strong, Bombay fixing at 77s. 6d. to Hull, while Karachi was reported to have paid 65s. to picked port. Australia secured tonnage at 95s. home. In the outward coal trade from Scottish ports and from the Tyne and Cardiff high rates continued to be paid. The following fixtures were reported :—Firth of Forth to Fécamp, 600 tons, 24s. ; Glasgow to Bordeaux, 2,800 tons, 36 fr. ; Glasgow to Genoa, 2,300 tons, 47s. 6d. ; Glasgow to Genoa, 5,000 tons, about 50s. ; Firth of Forth to Calais, Boulogne or Dunkirk, 480 tons, 25s.

Newcastle-on-Tyne.

As the outcome of considerable activity on the local coal market, the inquiry for steamers during the past week has been strong. Heavy weather at sea has made the arrivals irregular, however, with the result that rates of freight have advanced sharply in several instances. The general tone is very firm, and substantial increases are to be recorded in rates for all destinations. Coastwise, business is based on from 13s. to 13s. 6d. to London, an advance of 1s. 6d. on last week's prices. The demand for coke tonnage for

North Pacific business is brisk, but rather less interest is being taken in coasters. Rates have stiffened all round, however, and though Rouen is only fixed at 3d. to 6d. down, Havre is fixed 6d. to 1s. up and Bay ports 1s. to 1s. 6d. advanced. There is little inquiry for the Bay, but Bordeaux has paid 30s., an increase of 2s. on recent rates, and Rochelle 29s. Tonnage for the Mediterranean is offering very sparingly, but the demand also is very small indeed. Marseilles is from 1d. to 2d. lower on the week's work, but Savona has paid 50s., good to load, and an increase of 2s. when compared with last week's figures. The South Mediterranean is steady. Fixtures reported since last report include the following:—Bordeaux, 450, 20s. 3d.; 1,000, 21s.; Bordeaux, 1,500, 30s.; Charente, 1,000, 22s.; Coast, 600, 24s.; 750, 24s. 6d.; Dieppe, 250, 27s., coke; Havre, 1,250, 20s. 6d.; 1,500, 21s.; 750, 27s., coke; London, 1,400, 12s.; 1,700, 13s. 6d.; 1,600, 13s.; Las Palmas, 2,500, 28s.; Marseilles, 3,200, 41s.; 4,500, 41s. 1½d., from Dunston; Naples, 5,000, 47s. 6d.; Oran, 1,000, 33s. 6d.; Rouen, 1,250, 22s., special terms; 2,200, 21s.; 1,500, 21s. 6d., from Dunston; 900, 21s.; 1,500, 21s. 3d.; 1,460, 21s.; 1,700, 21s. 6d.; River Plate, 3,800, 37s. 6d.; Rochelle, 1,400, 29s.; Savona, 3,500, 50s.; Treport, 1,600, 22s. 6d.

Liverpool.

Outward freights on the market keep very firm, and business continues to be restricted by the continued scarcity of tonnage. But the Orders in Council controlling shipping engagements are also having their effect on chartering, and generally there is a disposition to hold back until the position in this connection is more clearly defined. Outward rates to the Mediterranean continue to have an upward tendency, while the short supply of tonnage is also keeping up rates to the River Plate. Fixtures for nearer positions are worth as under: Manchester to Charente, 25s.; Partington (Ship Canal) to Rouen, 17s. 9d.; Garston to Bordeaux, 22s. 6d.; and Garston to Cork, 12s. 6d. Time charter rates keep firm around 20s. for 12 months in the North Atlantic, while 22s. 6d. has been paid for a round trip in the Eastern trade. Homeward freights rule slow all round, and some markets are experiencing a scarcity of boats, which help rates to keep firm. North America is still a good country for grain tonnage, and Northern Range is paying 13s. 3d. to West Coast United Kingdom. Gulf indicates a grain rate of 14s. 3d. to United Kingdom. Flour from Northern States to French Atlantic paid 80s. for December. Cotton rates keep very firm, and charterers offer 260s. to Genoa for 150 ft. capacity boat. River Plate quiet but steady, and 82s. 6d. reported done from down river ports to United Kingdom for January. Eastern markets generally are firm but quiet. Tonnage is needed. Madras coast to United Kingdom at 100s., and 140s. is offering, copra basis. Philippines to United Kingdom or France. Australia has gained strength in sympathy, and 100s. is being required for wheat shipments to the United Kingdom. India firm at 77s. 6d. d.w. from Bombay, and 65s. net, Karachi to United Kingdom. Mediterranean homewards firm, and rates indicate a slight advance on small offerings. Nitrate ports are steady at 90s. to France, and North Pacific business indicates 140s. via Straits of Magellan to United Kingdom. Sail freights outwards are dull, and homewards quiet but steady.

Cardiff and Swansea.

The new Orders in Council relating to shipping have as yet had no effect on the freight market and cannot influence the market to any material extent for at least another month, as it will take some time before tonnage can be diverted from foreign trades. In fact, the tonnage scarcity is as pronounced as ever. So acute is the position that a number of new high records were established during the past week, Genoa, for instance, was fixed at 49s. 6d., or 2s. 6d. above the previous top level for the current year, while Port Said paid 51s., a jump of 3s., and Rouen 19s. 4½d., a rise of 1s. 4½d. Inquiries circulated on a fair scale for all directions, but chartering was restricted by the difficulties which merchants experienced in obtaining boats. Altogether, vessels to carry 145,850 tons were fixed to load at Cardiff or Newport, or 37,450 tons less than in the previous week. An urgent demand was existent for the Mediterranean, and rates continued to advance, Algiers fixing at 48 fr. (1,000 tons delivery—a new high record); Alexandria, 50s. 6d. (500 tons delivery—a new high record); Barcelona, 38s. (twice—a new high record); Genoa, with options, 48s. (twice), 49s. and 49s. 6d. (a new high record); Gibraltar, 29s. (twice) and 29s. 6d. (a new high record); Leghorn, 46s. 3d.; Lisbon, 25s. (twice, 350 tons delivery, and once, 500 tons delivery) and 25s. 3d. (400 tons delivery—a new high record); Marseilles, 56 fr. (three) and 57 fr. (a new high record); Port Said, 50s., 49s. and 51s. (a new high record); and Valencia, 33s. 6d. (twice). Bay and coasting business was comparatively slow owing to the shortage of tonnage supplies. Rates were easily upheld and in many cases substantially advanced. Bordeaux paying 31 fr.; Havre, 16s. 6d. (twice) and 16s. 9d. (a new high record); Nantes, 31 fr. (a new high record) and 29 fr., and Rouen, 18s. 6d. (five), 18s. 9d., 18s. 10½d., 19s. (three), 19s. 3d. (five), 19s. 4½d. and 19s. 6d. (three—a new high record). There was only a small inquiry for South America, with rates firm, on the basis of Buenos Ayres or La Plata, 39s. (three); and Rosario, 40s. The Islands also was a rather quiet section, at Las Palmas, 27s. 6d., and St. Vincent, 31s. and 30s., while West Africa was represented by Sierre Leone at 35s. and the East by Aden at 52s. Chartering from Swansea and Port Talbot though comparatively slow was a little brisker than in the previous week, tonnage to carry 33,150 tons being fixed, an increase of 3,580 tons. Inquiries were moderate with tonnage scarce and rates firm and upwardly inclined, Cagliari fixing at 47s. 6d.; Barcelona, 40s. (a new high record); Genoa, with options, 45s. 6d.; and Savona, 50s. Coast and Bay business was slow, with rates advancing, Caen fixing at 17s. 6d. and 18s. (a new high record); Dieppe, 18s. (a new high record); Rouen, 18s. 9d., 19s. (three), 18s. 6d. and 19s. 6d (twice—a new high record); and Treport, 19s.

Hull.

The market has become very firm owing to the great scarcity of tonnage and rates have been forced up until for Genoa from Hull 48s. 6d. rules and for Alexandria from Hull. 47s. 6d. In the coasting branch rates are very firm and handy sized boats, and in fact all sizes of tonnage, are difficult to secure. For Rouen from Hull 21s. 6d., for Dieppe from Hull 21s., and for Dunkirk from Goole 21s. 6d. is ruling. To London from Hull 13s. is now quoting. Licences are obtainable without delay for French destinations, but very few are granted for Scandinavian ports, and this is checking business in that direction. To the River Plate 37s. 6d. to 40s., according to size quotes for Buenos Ayres from Hull.

COMPANY MEETINGS.

London Maritime Investment Company, Ltd.—The 18th annual meeting was held last week at Winchester House, E.C., Sir Owen Philipps, K.C.M.G., Chairman, presiding. In moving the adoption of the report and balance sheet, he said that during the 18 years of the company's existence the average dividend paid had been 5½ per cent. per annum. The company was in a strong financial position, there being no debentures and no loans from bankers or otherwise, so that their 5 per cent. cumulative preference stock was a sound security which could be purchased at the present time to yield an investor over 5½ per cent. per annum. The reserve fund was separately invested in the British Four and a Half per Cent. War Loan. The profit for the past year, including the balance brought forward, amounted to £19,646. After paying the dividend on the preference stock and increasing the reserve fund to £12,500, the directors recommended a final dividend on the ordinary stock at the rate of 6 per cent. per annum, carrying forward the slightly increased balance of £1,200. It had always been the policy of the directors to write off depreciation upon its securities as opportunity offered. Largely as a result of this conservative policy, notwithstanding the fact that some of their investments as a consequence of the war stood in the books at more than their present market value, he was pleased to be able to state that a valuation of the investments as at the end of the financial year in the aggregate showed that the capital of the company was more than intact. The outlook for British shipping was favourable and the company's revenue prospects for the coming year were good.

Continuing, he said that he was interested to read a report of a recent meeting of the Hamburg Association of Shipowners, at which Herr Ballin, by far the largest shipowner in Germany, was the principal speaker. There was no one in Germany more competent to speak on German shipping in its various aspects. It was, therefore, instructive to note that such an experienced shipowner as Herr Ballin, speaking to Hamburg shipowners, frankly admitted that the German fleet was unable to give battle to the British Grand Fleet. Herr Ballin had probably few illusions about the naval aspect of the war and the inability of the German so-called High Sea fleet to sail on the "High Seas," or to protect any of the Hamburg American steamers in any part of the world. The German mercantile marine had been built up in the past with the active assistance and support of the German Government,

which support was none the less effective because it was generally indirect, and did not court publicity; such help, for instance, as the establishment of the control stations for emigrants, which were the cause of indirectly subsidising the German shipping companies in their competition with British shipping companies by probably not less than £1,000,000 per annum, while the preferential railway rates over the German State Railway for cargo shipped by German steamers was another case of indirect assistance to German shipping, the amount of which was difficult to estimate, but it gave German shipping companies an immense advantage. At the outbreak of the war, the German mercantile marine consisted of 5,459.296 tons, as compared with 19.256.766 tons owned by Great Britain. Of the German tonnage, 230,000 tons had been captured by the British Navy, and 38.000 tons by our Allies, 117,000 tons sunk and 397,000 tons interned in ports of the British Empire, while the remainder—namely, about 4,677,000 tons of German shipping—had, with the exception of an insignificant number of steamers running in the Baltic, for more than a year been rusting in German and neutral harbours. The services rendered by our Navy in guarding these shores and those of our Allies, in securing the safe transport of men and material upon a scale so vast as to be hitherto unknown in warfare, and in protecting British commerce, were incalculable, and if not always so widely appreciated as they might be, could never be forgotten, at least by those interested in the maritime industry of this country.

Mr. George Dodd seconded the resolution, which was carried.

COMPANY REPORTS.

Peninsular & Oriental Steam Navigation Company.—The directors, after providing for the usual dividend at the rate of 5 per cent. per annum on the preferred stock, less income-tax, recommend a dividend on the deferred stock of 5 per cent. for the past six months, together with a bonus at the rate of 5 per cent., both free of income-tax, making a total distribution on the deferred stock of 15 per cent. for the year.

Pacific Coast Steamship Company.—The report for the year ended June 30 shows a net income from operation of $689,089 (against $834,934 for 1914). After deducting charges, &c., and preferred dividends, there remains a balance of $84,002 ($279,309). The payment of the common dividend ($210,000) leaves a deficit of $125,998 (against $105,691). The extra dividend this year is equal to 2·21 per cent. on the combined common and second preferred (against 4·54 per cent. last year). The report says that the steamship business felt the full effects of the business depression during the year, but that, by consolidation of forces and other economies in operation, it was possible to reduce expenses so as to more than offset the decrease in gross earnings, which was $109,718.

West Hartlepool Steam Navigation Company, Ltd.—The report for the year ended March 31 states that trading has resulted in a profit of £121,840, to which has to be added the balance brought forward of £8,793, making a total of £130,633, and after charging classification expenses and repairs not recoverable from underwriters, there remains a balance of £117,606. Out of the net earnings an amount of £79,821 has been set aside for depreciation and a dividend of 5½ per cent. on the preference shares for one year, to June 30, 1908, has been paid, leaving a balance of £9,584 to carry to credit of next year's accounts. Since the close of the financial year four further dividends of 5½ per cent. each have been paid on the preference shares. The total tonnage owned by the company is 89,950 tons, which has been well maintained.

ORDERS PLACED.

The Union Iron Works have received an order from the Matson Navigation Company, San Francisco, for a duplicate of their ss. *Matsonia*, built in 1913, 480 by 58 by 36½ ft., and of 9,728 tons gross.

The Chester Shipbuilding Company, New York, whose works are located at Chester, Pa., on the site of the old Roach yard, has recently booked an order for two 4.000-ton d.w. steamers driven by geared turbines for Norwegian owners.

The Standard Oil Company of New York have placed an order with the Union Iron Works, San Francisco, for a shelter-deck oil carrier of about 10,500 tons d.w. The dimensions are 440 by 58 by 33 ft. The vessel will be constructed on the Isherwood system.

NEWS PARAGRAPHS.

Congestion at British Ports.—The Committee recently appointed by the Prime Minister to deal with congestion and difficulties at the various ports and docks of the United Kingdom are prepared to consider any representations that may be made to them on the subject. All communications should be addressed to Sir F. Dumayne, Secretary, Congestion Committee, Board of Trade, S.W.

Fruit Boats for American Trade.—According to *Shipping Illustrated*, the banana trade between Central American ports and the United Kingdom having come practically to a standstill recently, the United Fruit Company has taken over for operation to and from American ports four steamers of the Elders & Fyffes' fleets, its English subsidiary. The four steamers, formerly plying between Central America and the United Kingdom, are as follows: *Aracataca*, *Tortuguero*, *Zent* and *Barranca*.

Emigration of Eligible Men.—Sir John Simon, the Home Secretary, has stated in the House of Commons that the patriotic motives of the seamen and firemen in the port of Liverpool who protested against men of military age leaving the United Kingdom during this crisis are generally appreciated. The House is expecting some further intimation of the character of the Government measures to prevent the emigration of men eligible for military service, but the Home Secretary has not yet given it.

Requisitioning (Carriage of Food-stuffs) Committee.—All steamship owners who have tonnage already chartered from Atlantic ports (including Gulf ports) in the United States of America or Canada to the United Kingdom for wheat, are requested to give notice forthwith of such engagements to the Requisitioning (Carriage of Food-stuffs) Committee. Owners are further requested to co-operate with the committee by giving immediate notice of any fixture for wheat they may make in the future. All communications should be addressed to the Secretary, Requisitioning (Carriage of Food-stuffs) Committee, Transport Department, Admiralty, S.W.

Panama Canal.—Turner, Davidson & Co.'s latest advices from the Canal are to the effect that no definite date can yet be fixed for a re-opening. It is possible that the Canal authorities may allow to pass within the next week or two at their own risk any vessels still waiting, but this is not likely to be taken advantage of by oversea tonnage, owing to the risk of further slides. It may benefit the vessels of the screw schooner type, which, with a small bunker capacity, cannot face any other route. The Government geologist, Mr. Donald F. Macdonald, who has recently been on the ground, predicts that there will be no further slides of any consequence, but it must be remembered that this gentlemen, in 1912, ventured a similar opinion on the same district, where serious slides have occurred. It would appear that the pressure has so far relaxed that the Canal bottom no longer bulges up and a permanent channel is now available for the dredgers.

Percentages of Requisitions.—Dr. Macnamara, replying to Mr. Shirley Benn, states that the following shows the percentage of tonnage owned by certain companies requisitioned by the Government up to January 1, 1915, and the percentage owned by each house under requisition by the Government on October 1:—

	Up to January 1, 1915.	On October 1, 1915.
British India S.N. Co. Ltd.	16·5*	41·4
Canadian Pacific Railway Co.	16·0	20·0
T. Wilson, Sons, & Co., Ltd.	9·0	13·75
Raeburn & Verel		25·0
Maclay & McIntyre	2·1	21·5
E. T. Radcliffe & Co.	1·3	36·0
Foster, Hain & Read (E. Hain & Son)	36·4	25·7
W. Runciman & Co.	1·8	22·6
Prince Line, Ltd.	10·15	18·0

* 41·3 per cent. represents ships requisitioned by the Indian Government.

† 30 per cent. represents ships requisitioned by the Indian Government.

Dr. Macnamara adds that the figures given for the period from the beginning of the war up to January 1, 1915, represent the proportion of the total time for which the ships requisitioned were on Government service bears to the full working time of the whole fleet for the period August 4, 1914, to January 1, 1915. The details given for October 1, 1915, show the percentage of ships belonging to the respective firms which were actually on service at that date.

"SHIPBUILDING AND SHIPPING RECORD" TABLE OF MARINE CASUALTIES

(Including losses incidental to the war).

Vessel	Gross Tonnage	Owners, Builders and Year Built	Casualty.
Adour, s. [illegible]	1,[illegible]	[illegible] Aktie. Vfg. (tk. Salvesen) Kristiansund. Lindkvist Mek. Værks, Hammerfest. (1906.)	Nov. 14: Ashore near Halmstad, Norway. Cargo coal.
Ancona, t.ss.	8,210	Soc. di Navig. a Vapore Italia, Genoa. Work. Navy Cantiere, Riva Trigoso. (1908.)	Nov. 7: Torpedoed by Austrian submarine off Cape Carbonara. 200 drowned.
Bedale, ss. ..	2,197	[illegible] Wm. Cory & Son, Ltd. W. Hartlepool. Northumberland S.B. Co., Londonderry. (1914.)	Nov. 8: In collision. Nov. 9: Sunk. Topmast above water.
Bernabe, ss. ex [illegible]	2,263	[illegible] Cia. Carbonera, Bilbao. J. Readhead & Sons, S. Shields. (1889.)	Nov. 13: Cargo coal. Wrecked off Roche des Bassets (near Coubre).
Bosnia, ss. ..	2,561	Soc. Italiana di Servizi Marittimi, Venice. G. Ansaldo & Co., Sestri Ponente. (1898.)	Nov. 14: Reported "sunk."
Calburga, s.	1,4[illegible]	[illegible] Douglas, Maitland, N.S.W. A. M'Dougall, Maitland. (1890.)	Nov. 13: Wrecked off Strumble Head.
Californian, ss.	6,22[illegible]	[illegible] Leyland & Co., Liverpool. Caledon S.B. & Eng. Co., Dundee. (1902.)	Nov. 10: Reported "sunk."
Caria, ss. ex *Clan[illegible]*	3,032	Cayzer, Irvine & Co., Glasgow. Tyne Iron S.B. Co., Newcastle. (1900.)	Nov. 11: Reported "sunk." Crew saved.
[illegible] German steamer	[illegible]	[illegible]	Nov. 9: Brought into Terschelling (Holland). (Not *U.* 8 as previously reported.)
Clan Macalister, ss.	4,845	Cayzer, Irvine & Co., Glasgow. A. McMillan & Son, Dumbarton. (1903.)	Nov. 10: Reported "sunk."
Colonial Empire, s.s.	2,436	Cook & Dundas, London. J. Reid & Co., Glasgow. (1902.)	Nov. 13: Beached on Cardinaux Rock (near Belle Isle) and abandoned. Reported total wreck.
Cordelia, ss.	1,046	A. Karsten, Hamburg. Sunderland S.B. Co., Sunderland. (1902.)	Emden for Carlsrona, cargo of coal. Nov. 9: Torpedoed in Baltic and sunk.
Den of Crombie, ss.	4,949	The Barrie S.S. Co. (C. Barrie & Sons), Dundee. C. Connel & Co., Glasgow. (1907.)	Nov. 12: Reported "sunk."
E. 20 (British submarine)	—	.. ..	Nov. 13: Reported sunk in Turkish waters.
Elisa Francesca, s.v.	210	G. Sorrentino, Torre del Greco, Italy. M. Donnarumma, Torre del Greco. (1907.)	Nov. 9: Torpedoed by German submarine off Algiers.
Firenze, t.ss.	3,960	Soc. Marittima Italiana, Genoa. Cant. Nav. Ruiniti, Spezia. (1912.)	Nov. 9: Reported sunk by Austrian submarine.
George Watts, ss. ..	436	African Assn., Liverpool. G. Brown & Co., Greenock. (1911.)	Oct. 14: Ashore on bar at entrance to River Eket, Nigeria. Bottom plates damaged. Water up to hold.
Greenock, s.v. ..	165	Consolidated Steam Fishing & Ice Co. (J. D. Marsden), Grimsby. Mackie & Thomson, Glasgow. (1897.)	Nov. 15: Reported "sunk."
Irene (Trinity House yacht)	.. ..	.. ..	Nov. 9: Reported "sunk."
Le Calvados, ss. .	1,658	Cie. Générale, Transatlantique, St. Nazaire. Soc. Cockerill, Hoboken. (1890.)	Nov. 8: Torpedoed off Oran on Nov. 3 and sunk.
Livietta, ss. ..	2,760	Dall 'Orso & Co., Spezia. N. Odero fu. A. Sestri Ponente. (1899.)	Nov. 12: Reported fire in after holds. Aground off Galveston.
Louis, t.b.d. (British)	—	.. ..	Nov. 10: Stranded in Eastern Mediterranean. Total wreck.
Monnikendam, ss. ex *Webster.* ex *Beta*	2,003	Vratchvaart Maats. "Edam" (B. J. van Hengel en de Wed. Jan Salm & Meijer), Amsterdam. W. Gray & Co., W. Hartlepool. (1899.)	Nov. 10: Hole repaired and proceeding to Amsterdam.
Moorside, ss.	311	Catcheside S.S. Co. (T. H. Catcheside & Co.), Newcastle. Dundee S.B. Co. (1908.)	Nov. 12: Reported "sunk."
Rhineland, ss. ..	1,501	Liverpool & Hamburg S.S. Co. (D. Currie & Co.), Liverpool. Barclay, Curle & Co., Glasgow. (1903.)	Nov. 11: Reported "sunk."
Rochambeau, ss.	12,678	Cie. Générale Transatlantique, Havre. Chant. de l'Atlantique, St. Nazaire. (1911.)	New York for Bordeaux. Nov. 8: Reported fire in bunkers, extinguished next day.
Roi Leopold, ss.	1,955	"Ocean" Soc. Anon. Belge d'Armement et de Nav. (L. Dens & Co.), Antwerp. W. Dobson & Co., Newcastle. (1909.)	See *Shipbuilding and Shipping Record,* Oct. 28. Nov. 9: Breaking up. Condition regarded hopeless.
Saint Malo, ss. ..	1,243	Cie. Générale Transatlantique, St. Nazaire. Chant. et Atel. de Provence, Port de Bouc. (1906.)	Nov. 13: Wrecked off Island of Guernsey. Strong gale.
Scilla, ss.	1,220	Soc. Nazionale di Servizi Marittimi, Palermo. Macnab & Co., Greenock. (1866.)	Oct. 26: Torpedoed in Ægean Sea by enemy submarine and sunk.
Sir Richard Awdry, ss.	2,234	Pekin Syndicate, London. Clyde S.B. & Eng. Co., Pt. Glasgow. (1912.)	Nov. 13: Reported "sunk."
Trevelyan ss. .	3,066	Hain SS. Co. (Ed. Hain & Son) St. Ives. J. Readhead & Sons, S. Shields. (1894.)	Nov. 15: In collision with steamer *Oostdijk* off Start Point. Bows stove in.
Tunisiana, s.s. (ex *Balaclava*)	4,220	Furness, Withy & Co., London. Northumberland S.B. Co., Newcastle. (1906.)	Nov. 12: Torpedoed off Barnard Sands in June last. Now total wreck.
Wacousta, ss. ..	3,521	Act. Dpsk. Wacousta (Christensen & Stenseth), Sandefjord. A. McMillan & Son, Dumbarton. (1908.)	Nov. 13: Reported "sunk."
Yser, ss. ex French ss. *Dacca*	3,544	E. N. Breitung, Marquette, Mich. C. S. Swan & Hunter, Newcastle. (1900.)	Nov. 9: Torpedoed by German submarine off Algiers and sunk after saving passengers and crew of *Elisa Francesca* q.v. supra.

"SHIPBUILDING AND SHIPPING RECORD" TABLE OF SHIP SALES.

Name and type.	Tonnage.	Dimensions. Draught in ( ).	Sold by, to	Builders, hull and year.	Machinery and builders.	Remarks.
Aagot, ss. (ex *Helen Otto*)	1,385 gr. 854 net. 2,060 d.w.	249′ × 36′ × 17½′ (17¼′)	Acties, Aagot (A. Chr. Hein & Son) Arendal, to buyers not stated	J. Readhead & Co., South Shields (1883)	29, 54 × 36 (J. Readhead & Co.)	450,000 kr.
Arcotes, ss. (well dk.) (ex *Manchester*)	2,034 gr. 1,282 net.	275′ × 37½′ × 20′ (21⅝′)	Goitia y Cia, Bilbao, to Norwegian buyers	W. Gray & Co., W. Hartlepool (1890)	21½, 34 57 × 39 (Cen. Mar. Eng. Works, W. Hartlepool)	Price about £30,000.
Bessfield, s.v. ...	1,342 gr. 1,235 net. 2,060 d.w.	239½′ × 36¼′ × 21′	Akties, Bessfield (J. J. Hassel) Risör to Bugge & Olsen, Laurvig	Workman, Clark & Co., Belfast (1886)	—	Price about £8,800. Sold in Dec., 1910, for about £2,300.
Bizkaya, ss. (ex *Howick*)	1,543 gr. 1,010 net. 2,310 d.w.	255′ × 33½′ × 23′	Ciadel Vap Bizkaya (Vinda de Blas de Otero & Co.), Puerto Cortes to Leopold Walford & Co., London	A. Leslie & Co., Newcastle (1878)	31, 58 × 33 (N.E. Mar. Eng. Co., Sunderland)	—
Bur, ss. (ex *A. J. Hocken*)	1,806 gr. 1,058 net. 3,110 d.w.	270′ × 40⅝′ × 18¼′ (17½′)	Rederi Aktieb. Union (N. W. Löf) Stockholm to C. Brodin, Stockholm	Grangemouth & Greenock Dockyard Co., Grangemouth, (1901)	20, 32⅜, 53 × 36 (S. & H. Morton, Leith)	Price about £34,750. Sold in July for about £17,500.
Cabo Creux, ss. (well dk.), (ex *Landore*)	1,421 gr. 994 net. 1,810 d.w.	254′ × 32¾′ × 18¼′	Ybarra & Co., Seville, to British buyers	Schlesinger Davis & Co., Newcastle (1880)	30, 58 × 36 (R. & W. Hawthorn (Newcastle)	Price about £14,000.
Ciscar, ss. (spar dk.) (ex *Lissabon*)	1,530 gr. 948 net. 1,960 d.w.	250′ × 33½′ × 13⅞′ (19⅛′)	Cia Maritima, Barcelona, to British buyers	J. Blumer & Co., Sunderland (1892)	20, 32, 52 × 39 (G. Clark, Sunderland)	—
Collingham, ss.	4,080 gr. 2,540 net. 7,200 d.w.	351½′ × 51′ × 25½′	Freear & Dix SS. Co., London, to Turnbull Bros., Cardiff	J. L. Thompson & Sons, Sunderland (1910)	25, 42, 68 × 48 (J. Dickinson & Sons, Sunderland)	Price about £90,000. Sold last May for about £61,000.
Eleni G Embiricos, ss. (spar dk.) (ex *Elena*, ex *Lydna*)	2,868 gr. 1,855 net. 4,760 d.w.	309½′ × 44½′ × 15½′ (21⅝′)	M. G. Embiricos, Andros, to buyers not stated	Russell & Co., Port Glasgow (1900)	22½, 37, 62 × 42 (J. G. Kincaid & Co., Greenock)	Price about £55,000.
Eurania, ss. (cargo)	—	—	Rolph Navigation Co., San Francisco, to Southern cotton interests per Mr. Strachan, Savannah, Ga.	—	—	Now building at Union Iron Works, San Francisco.
Havet, ss. (ex *Hafvet*)	1,405 gr. 863 net.	241½′ × 36¼′ × 16½′	N. K. Ströyberg, Aalborg, to buyers not stated	Howaldtswerke, Kiel (1907)	16½, 27½, 43½ × 29½ (Howaldtswerke, Kiel)	Price about 600,000 kr.
Hilda Lea, ss. (ex *Cygnus*)	1,185 gr. 713 net.	235′ × 36¼′ × 15¾′	E. Grant Lea, Bergen, to Akt. "Hav," Christiania	Wood, Skinner & Co., Ltd., Newcastle (1906)	18½, 30, 49 × 33 (N.E. Mar. Eng. Co., Newcastle)	Price about 650,000 kr.
Hyllos, ss. (ex *Craigneuk*)	2,646 gr. 1,531 net. 4,360 d.w.	314½′ × 44′ × 20¾′ (19¼′)	Aktieb. Navigator (G. W. Snellman), Helsingfors, to buyers not stated	A. Rodger & Co., Port Glasgow (1898)	20, 34, 58 × 42 (Hall-Brown, Buttery & Co., Glasgow)	Price about £25,000. Sold in June, 1907, for about £21,000.
Kingsgate, ss. ..	3,717 gr. 2,370 net. 6,200 d.w.	346½′ × 50¾′ × 24¼′	London Gate SS. Co. (H. W. Dillon & Sons), London, to Brys & Gylsen, London	J. L. Thompson & Sons, Sunderland (1909)	25, 41, 67 × 45 (G. Clark, Sunderland)	—
Karistinakis, ss. (pt. awning dk.) (ex *Verbena*)	2,347 gr. 1,493 net. 3,710 d.w.	293′ × 41′ × 17½′ (19½′)	L. A. Caristinakis, Andros, to buyers not stated	Furness, Withy & Co., West Hartlepool (1895)	22, 35½, 59 × 39 (T. Richardson & Sons, Hartlepool)	Price about £40,000. Sold in Aug., 1910, for about £8,000.
Lord Dufferin, ss.	4,664 gr. 3,007 net.	400′ × 48½′ × 28½′	Irish Shipowners' Co. (T. Dixon & Sons), Belfast, to British buyers	Palmers' Co., Newcastle (1898)	28, 46, 76 × 51 (Palmers Co.)	—
Neath Abbey, ss. (ex *Kilmore*)	2,340 gr. 1,502 net. 4,000 d.w.	306′ × 44½′ × 20 (19¼′)	Melrose SS. Co. (F. Jones & Co.), Newcastle, to J. C. Gould & Co., Cardiff	Craig, Taylor & Co., Stockton (1903)	22, 36, 58 × 39 (N.E. Mar. Eng. Co., Newcastle)	Price about £50,000.
Neilrose, ss. (ex *Craigmhor*, ex *Garscube*)	3,568 gr. 2,297 net. 6,000 d.w.	335⅝′ × 49½′ × 21¼′	Neilrose SS. Co. (Letricheux & David), Leith, to the Woolston SS. Co. (S. Instone & Co.), Cardiff	A. McMillan & Son, Dumbarton (1906)	25, 41, 67 × 45 (J. G. Kincaid & Co., Greenock)	—
Sophia, ss. (ex *Barendrecht*)	3,223 gr. 2,092 net.	330½′ × 47′ × 24′ (23′)	C. E. Moussouris (N. D. Lykiardopulo), Argostoli, to Scandinavian buyers	R. Craggs & Sons, Middlesbrough (1901)	24, 38, 64 × 42 (Richardsons, Westgarth & Co., Hartlepool)	Price about £70,000. Sold in March, 1914, for about £21,000.
Sophie H., ss. ...	2,930 gr. 1,851 net.	-	Stoomv. Maats. "Sophie H." N. Haas, Rotterdam, to Lauritz Kloster, Stavanger	Kon. Maats. de Schelde, Flushing (1910)	23⅜, 38, 64 × 42 (Kon. Maats. de Schelde)	Price about 1,200,000 guilders (Amended particulars.)
Sir Richard Awdry, ss.	2,234 gr. 1,236 net.	275½′ × 44¼′ × 19¼′	Pekin Syndicate, Ltd., London, to French buyers	Clyde S.B. & Eng. Co., Port Glasgow (1912)	21, 33, 57 × 36 (Clyde S.B. & E. Co.)	Price about £60,000.
Luckenbach, ss. (ex *Brooklyn*, ex *McPherson*, ex *Obtam*, ex *British Queen*) re-named **Onega**	3,636 gr. 2,276 net.	401′ × 39⅝′ × 21¼′	E. F. Luckenbach, New York, to Barber & Co., New York	Harland & Wolff, Belfast (1880)	28¾, 46½, 74 × 51 (Nederl. Stoomb. Maats., Rotterdam)	
Uller, ss. (pt. awning dk.)	1,860 gr. 1,163 net.	271¼′ × 39½′ × 16½′	Acties. Uller (Hjalmar Roed & Co.), Tönsberg, to buyers not stated	J. Priestman & Co., Sunderland (1897)	20½, 34, 56 × 39 (N.E. Mar. Co., Newcastle)	Price about £26,000.
Uriarte, No. 1, ss. (pt. awning dk.) (ex *Beltisloe*)	2,835 gr. 1,640 net.	314′ × 40⅝′ × 21¼′ (22½′)	Cia Nav. Uriarte (J. A. Acha), Bilbao	Furness, Withy & Co., W. Hartlepool (1893)	24, 38, 64 × 42 (T. Richardson & Sons, W. Hartlepool	
Wollowra, ss. (spar dk.) (ex *Silvio Spaventa*)	2,631 gr. 1,678 net. 3,410 d.w.	323′ × 40½′ × 17¼′ (23¼′)	Adelaide SS. Co., Adelaide, to Eastern buyers	Palmers Co., Newcastle (1891)	28, 45, 74 × 48 (Palmers Co.)	—

SHIPPING SHARE MARKET.

[illegible] shareholders widely extended during the past twelve months. Royal Mails continue to move upward as a result of a continued demand for the [illegible] unnecessarily frightened into selling on the fall in profits last year. [illegible] this week at 289, which is within a point or so of the highest recorded this year. Cunards and Furness Withys have also changed hands at [illegible] West Hartlepool Steam Navi-[illegible] [illegible] preference shares which stood at under 5 early in the year and at 3 when the war broke out are now nominally quoted at about 7. There were 10 per cent. of arrears accumulated on the shares at October, 1914, but this amount has now been considerably reduced. The balance for the year ended March, 1914, after provision for debenture interest and depreciation, was £2,26[illegible], whereas for the year ended March, 1915, the balance enables a full year's dividend to be paid on the preference shares and £9,58[illegible] to be carried forward. There appears to be some confusion as to the amount of arrears paid, the statement issued with the report being that "since the close of the financial year four further dividends of 5½ per cent. each have been paid on the preference shares." These payments do not appear to have been published in the financial papers at the time of payment, but it may be stated that the arrears have now been reduced to 16½ per cent., that is, the two years ended June, 1915, are overdue.

SHIPPING, SHIPBUILDING, ENGINEERING AND MARINE INSURANCE SHARE LIST.

SHIPPING AND DOCKS.

Name.	Share and paid.	Extreme quotations, 1913.	Last ann. div. or per share.	Yield. %	Quotation, July 30, 1914.	Cash price during week.
	£					
African S.S.	20	21⅜—19[illegible]	7	7[illegible]	18 20	18 20
Anchor Line ... Cum. pref.	10	9[illegible] -10	5[illegible]	5[illegible]	10 10½	10½
Do. ... ... Deb.	Stk.	98⅛—98⅜	4[illegible]	4[illegible]	104-106	102½
Argentine Nav. ... Cum. pref.	1	29/6—2[illegible]	3	4[illegible]	[illegible] [illegible]	[illegible]
Do. ... ... Deb.	Bds.	104⅛—100¼	6	6[illegible]	98—100	95
Australasian Un. S. Nav. Deb.	Stk.	84⅜ 81½	4	4[illegible]	80 83	80 83
British Steam ... ... "A"	[illegible]	5[illegible]—4½	[illegible]	3	4½—5½	5
Brit. S. African Nav. Deb.	Stk.	102 101	4½	4[illegible]	96[illegible] 98½	99[illegible]
British India Nav. ... Deb.	Stk.	104—98⅛	4½	4[illegible]	99½ -100	95
Bucknall SS. ... Cum. pref.	2	2[illegible]—1[illegible]	5[illegible]	—	—	
Canada Line ... ... Deb.	Bds.	102 94	5	5½	91—93	90[illegible]-91
Clan Line ... ... Ord.	10	142—9	15	10[illegible]	10½—11	13[illegible]
Court Line ... ... Ord.	£1	—	10	7[illegible]	—	1[illegible]
Cunard SS. ... ... Ord.	1	35 9 28	20	6[illegible]	12⅛ 11½	5[illegible]
Do. ... Cum. pref.	Stk.	103—97⅞	5	5[illegible]	99—101	91[illegible]
Do. ... ... Deb.	Stk.	102[illegible]—99	4½	4[illegible]	101 103	96
Elder Line ... ... Deb.	Stk.	103—100	4½	5	98—102	90
Elder Dempster ... Cum. pref.	1	1[illegible]—1[illegible]	5½	5[illegible]	1[illegible]—1[illegible]	1[illegible]
Do. ... ... Deb.	Stk.	105 99[illegible]	5	5[illegible]	102—104	91[illegible]
Ellerman Lines ... Pref. Ord.	10	10[illegible]—10[illegible]	6[illegible]	6	10—10½	9½
Do. ... Cum. pref.	10	10[illegible] 10[illegible]	4[illegible]	4[illegible]	10—10½	9½
Fraser Fenwick ... Cum. pref.	5	97 6 92 6	5[illegible]	5[illegible]	4½—5	4½
Furness, Withy ... ... Ord.	1	3[illegible] 3 25 6	[illegible]	8[illegible]	1[illegible]—1[illegible]	1[illegible]
Do. ... Cum. pref.	10	9[illegible]—9[illegible]	5	5[illegible]	9½—10	9
General Steam Nav. ... Ord.	7½	6[illegible]—5[illegible]	6	[illegible]	5[illegible]—5[illegible]	6[illegible]
Do. ... ... Pref.	5	7[illegible]—7[illegible]	[illegible]	[illegible]	7[illegible]—7[illegible]	6[illegible]
Houlder Line ... Cum. pref.	5	5[illegible]—6[illegible]	Nil	Nil	2[illegible]—2[illegible]	3[illegible]
Do. ... ... Deb.	Stk.	84[illegible]—8[illegible]	4½	5[illegible]	81—86	84½
Houlder Bros. ... Cum. pref.	5	4[illegible] 3	5[illegible]	5[illegible]	4[illegible]—4[illegible]	4[illegible]
Do. ... ... Deb.	Stk.	86—78	4½	5[illegible]	81—86	82
India Gen. Nav. & Rly. ... Ord.	10	9[illegible] 7[illegible]	8	[illegible]	9 10	9½
Indo-China N. ... Pref Ord.	5	5[illegible]—87/6	6	5[illegible]	3[illegible]—4[illegible]	5[illegible]
Irrawaddy Flotilla	40	125—114	5	4[illegible]	126[illegible]—128[illegible]	—
King Line ... ... Ord.	10	9[illegible]—8	8	7[illegible]	8[illegible] 9[illegible]	11[illegible]
La Guaira Harbour ... Deb.	Stk.	87—79	5	5[illegible]	78—80	86
Lamport & Holt ... Cum. pref.	£1	1[illegible]—[illegible]	6	6	1[illegible]—1[illegible]	[illegible]
Leyland (F.) ... Cum. pref.	10	11—9[illegible]	10	1[illegible]	7[illegible]—8[illegible]	7[illegible]
Do. ... ... Deb.	100	99[illegible]—95[illegible]	4	4	99—101	—
Mercantile SS. ... ... Ord.	5	8[illegible]—6[illegible]	17[illegible]	1[illegible]	6—6[illegible]	8[illegible]
Do. ... ... Pref.	1	18[illegible]—18[illegible]	5	5[illegible]	[illegible]—1	[illegible]
Moor Line ... ... Ord.	10	14—11[illegible]	15	—	—	—
Nelson Steam Nav. ... Deb.	100	103[illegible]—99	5	5[illegible]	99½—101½	96
New Zealand ... ... Ord.	£1[illegible]	20[illegible]-1[illegible]	8	4[illegible]	14½—15[illegible]	19[illegible]
Do. ... ... Deb.	Stk.	95—92[illegible]	4	4[illegible]	92—94	89[illegible]
Nitrate Producers SS. ... Ord.	5	8[illegible]—8	17[illegible]	6[illegible]	8—8[illegible]	12[illegible]
Do. ... Cum. pref.	5	5—97/6	5	5	4[illegible]—5	4[illegible] 5
Oceanic Steam. Nav. ... Deb.	100	100—96[illegible]	4[illegible]	4[illegible]	97—99	98[illegible]
Orient.Stm.Nav.Co. Cum. pref.	10	10[illegible]—9[illegible]	5	5[illegible]	[illegible] 10	9[illegible]
Do. ... ... Deb.	100	99—94[illegible]	4[illegible]	4[illegible]	98—100	96
P. & O. S. N. ... Cum pref.	100	125[illegible]—107	5	4[illegible]	109—112	97[illegible]
Do. ... ... Def.	100	350—270	15	5[illegible]	270—290	280
Do. ... ... Deb.	Stk.	91 83	[illegible]	5	84—86	79[illegible]
Peninsular Line	1	25/3—20/—	5	22	1—1[illegible]	2[illegible]
R.M.S.P. ... ... Ord.	100	143—100[illegible]	Nil.	Nil.	82—87	91
Do. ... ... Pref.	Stk.	100[illegible] 96	5	5[illegible]	98—101	85[illegible]
Do. ... ... Deb.	Stk.	104[illegible]—100[illegible]	4[illegible]	5[illegible]	101—103	88[illegible]
Shaw, Savill & Alb. Cum. pref.	5	5[illegible]—98 3	5	[illegible]	4[illegible]—5	4[illegible] 5
Shell Transport ... ... Ord.	1	5[illegible]—98 1[illegible]	30	6[illegible]	4—4[illegible]	1[illegible]
Do. ... Cum pref.	10	11[illegible]—10	5	5[illegible]	10[illegible]—10[illegible]	9[illegible]
Sutherland SS. Co.	£1	1[illegible]—1	2[illegible]	13[illegible]	1—1[illegible]	1[illegible]
Union-Castle SS. Cum. pref.	10	10—9[illegible]	4[illegible]	5	8[illegible]—9[illegible]	[illegible]
Do. ... ... Deb.	Stk.	95[illegible]—92	4	4[illegible]	93—95	88
West Hartlepool ... ... Pref.	10	4[illegible]—3[illegible]	5[illegible]	[illegible]	2[illegible]—3[illegible]	5[illegible]

INSURANCE.

Alliance	20 (2·4 pd.)	12[illegible] 11[illegible]	12 -	7	11[illegible] 12[illegible]	8[illegible]
Do. new shares.	1	14[illegible]—12[illegible]	12/-	5[illegible]	13[illegible] 14[illegible]	10[illegible]
Indem. Mutual Marine	15 (— pd.)	10[illegible]—8[illegible]	1[illegible]	6[illegible]	10—11	9[illegible]
London Assurance	25 (7½ pd.)	54—49	20	6	54—56	42[illegible]
Marine Insurance	25 (15 pd.)	38[illegible]—36[illegible]	45 -	6[illegible]	38[illegible] -39[illegible]	34[illegible]
Maritime Insurance	10 (2 pd.)	5[illegible] 4[illegible]	12[illegible]	-	8[illegible]—8[illegible]	-
Merchants' Marine Insurance ...	10 (2½ pd.)	8[illegible] 3—6[illegible] 3	7[illegible]	5	4 4½	3[illegible]
N. British & Mercantile Ord.	25 (6½ pd.)	40[illegible]—38[illegible]	4[illegible]	7[illegible]	40[illegible] -41[illegible]	37[illegible]
Do. Pref.	Stk.	100[illegible]—95[illegible]	4	5[illegible]	98 - 100	77[illegible]
Phœnix Assurance	10 (1 pd.)	7[illegible]—7	40	6[illegible]	7[illegible]—8[illegible]	2[illegible]
Reliance Marine	10 (2 pd.)	7 6[illegible]	17[illegible]	4[illegible]	7[illegible] 7[illegible]	7
Royal Exchange Assurance ..	Stk.	210—196[illegible]	10	5[illegible]	213—218	185
Sea Insurance	10 (2 pd.)	20—17[illegible]	8	4	20—21	-
World Marine, Limited ..	5 (2 pd.)	25/—23 1[illegible]	5	5[illegible]	1[illegible]—1[illegible]	1[illegible]

* With arrears. † Includes 2[illegible] bonus.

IRON AND STEEL.

Name.	Share and paid.	Extreme quotations, 1913.	Last ann. div. ½ or per share.	Yield. %	Quotation, July 30, 1914.	Cash price during week.
	£					
Babcock & Wilcox... ... Ord.	1	69/4[illegible]—56/3	16	5[illegible]	2[illegible]—2[illegible]	2[illegible]
Baldwins ... Cum. pref.	1	22/6—21/3	5[illegible]	5[illegible]	1[illegible]—1[illegible]	1[illegible]
Do. ... ... Deb.	Stk.	100[illegible]—100[illegible]	4[illegible]	4[illegible]	97—99	98
Bayliss, Jones ... Cum. pref.	1	—	5	7[illegible]	[illegible]—[illegible]	[illegible]
Bell Bros. ... ... Cum. pref.	10	12[illegible]—11	6	5[illegible]	11[illegible] -12[illegible]	10[illegible]
Do. ... ... Deb.	Stk.	98—96[illegible]	4	4[illegible]	96 98	96 98
Bessemer (Henry) ... Ord.	1	1[illegible]—1[illegible]	10	8[illegible]	1[illegible]—1[illegible]	1[illegible]
Bolckow Vaughan ... Ord.	1	22/6-19/4[illegible]	6	6[illegible]	1[illegible]—1[illegible]	[illegible]
Do. ... ... Cum. pref.	20	21[illegible]—20/-	5	5[illegible]	20 21	19[illegible]
Cargo Fleet Iron ... ... Ord.	1	11/10[illegible]—7/6	2[illegible]	5	1[illegible] - [illegible]	[illegible]
Do. ... ... Deb.	100	91—85[illegible]	4[illegible]	5[illegible]	89 92	87
Consett Iron Co. ... ... Ord.	1	88/6—74/6	30	10[illegible]	32 - 33	2[illegible]
Dominion Iron & Steel	Bds.	100[illegible]—88[illegible]	5	6[illegible]	83 - 87	74[illegible]
Dorman, Long ... ... Ord.	1	21/6—16/9	7[illegible]	8[illegible]	[illegible]—[illegible]	1[illegible]
Do. ... ... Deb.	Stk.	88[illegible]—85[illegible]	4	4[illegible]	87 - 90	84[illegible]
Ebbw Vale Steel & Iron ... Ord.	1	18 — 16/	10	11[illegible]	[illegible] - [illegible]	[illegible]
Guest, Keen & Nettefids ... Ord.	1	68/9—61/3	15	4[illegible]	3[illegible]—3[illegible]	3[illegible]
Do. ... ... Cum. pref.	5	5[illegible]—5[illegible]	5	4[illegible]	5[illegible]—5[illegible]	5[illegible]
Do. ... ... Deb.	Stk.	100[illegible] -95[illegible]	4	4[illegible]	96 - 98	85[illegible]
Hadfield's Steel Foundry Ord.	1	63 - 58 9	22[illegible]	6[illegible]	3 - 3[illegible]	3[illegible]
Hawthorn (R. & W.) Leslie Ord.	10	13—12	10	7[illegible]	13[illegible]—13[illegible]	12[illegible]-13[illegible]
Hibbotson Bros. ... ... 5 (4 pd.)		7—5[illegible]	10	7[illegible]	6—6[illegible]	6—6[illegible]
Jessop (W.) & Sons ... Ord. 5 (4 pd.)		6[illegible] -6[illegible]	15	11[illegible]	6[illegible]-6[illegible]	6[illegible]
Lanarkshire Steel Cum. pref.	10	7[illegible]—6[illegible]	5	6[illegible]	5[illegible]—6[illegible]	6
Lysaght (J.) ... Cum. pref.	1	27/6—25/-	8	5	1[illegible]—1[illegible]	1[illegible]
Do. ... ... Deb.	Stk.	108[illegible]—102[illegible]	4[illegible]		104—106	—
Manganese Bronze ... Ord.	1	[illegible]—[illegible]	[illegible]	11	[illegible]—[illegible]	[illegible]
Do. ... ... Cum. pref.	1	1—[illegible]	6	6[illegible]	[illegible] 1	[illegible]
North-Eastern Steel ... Deb.	Stk.	89—92	4[illegible]	—	—	—
Palmers Ship & Iron "A"	1	[illegible]—[illegible]	Nil.	Nil.	[illegible] [illegible]	[illegible]
Scott (Walter) ... ... Ord.	1	16 —14 6	5	6[illegible]	[illegible] [illegible]	[illegible]
Do. ... ... Deb.	Stk.	86—82	4	4[illegible]	81—82	89 91
Sheffield Forge ... ... Ord.	1	1[illegible] 1[illegible]	12[illegible]	7	1[illegible] 1[illegible]	1[illegible]
Shelton Iron & Steel ... Deb.	100	99[illegible]—90	5	5[illegible]	93- 98xd	94[illegible]
S. Durham Steel & Iron Ord.	1	35 - 23 6	10	6[illegible]	1[illegible]—1[illegible]	1[illegible]
Do ... ... Cum. pref.	1	20 6—19 -	8	5[illegible]	[illegible] 1[illegible]	1[illegible]
Do. ... ... Deb.	Stk.	95—98	4[illegible]	4[illegible]	90 92	90 - 92
Steel Co. of Scotland ... Ord.	10	12[illegible]—8[illegible]	5	5[illegible]	8½ - 9	[illegible]
Stewarts & Lloyds Pref. ord.	10	21[illegible]—20	10	5[illegible]	20 - 21	19[illegible]
Do. ... ... Cum. pref.	10	14[illegible]—13[illegible]	6	4[illegible]	11[illegible]—13[illegible]	13[illegible]
Stone (J.) ... ... Cum. pref.	10	9[illegible]—9	5	5[illegible]	8[illegible] -9[illegible]xd	9
United States Steel ... Ord.	100$	71[illegible]—50	3	3[illegible]	61 61½	59[illegible]
Do. ... ... Cum. pref.	100$	114[illegible]—104[illegible]	7	5[illegible]	112—113	121[illegible]
Vickers Ltd. ... ... Ord.	1	43/6—33/3	12[illegible]	7[illegible]	11[illegible] -12[illegible]	11[illegible]
Do. ... ... Pref.	Stk.	106[illegible]—99	5	5	104 107	100
Do. ... ... Deb.	Stk.	100[illegible]—91[illegible]	4	4[illegible]	96[illegible] 98[illegible]	82[illegible]
Weardale Steel ... Def. ord.	1	21 —17 -	6	7[illegible]	[illegible] [illegible]	[illegible]
Do. ... ... Cum. pref.	1	20 1[illegible]-18/-	6	6[illegible]	1[illegible]—1	1[illegible]
Do. ... ... Deb.	Stk.	77—73[illegible]	4	5	77- 80	77 80
Workington Iron & Steel Ord.	1	16/6—12/3	8	8[illegible]	[illegible]—[illegible]	11

SHIPBUILDING AND MARINE ENGINEERING.

Armstrong, Whitworth Ord.	1	60 —39/	12[illegible]	6	13[illegible]—2[illegible]	1[illegible]
Do. ... ... Cum. pref.	5	95 —81/6	4	5[illegible]	4[illegible]—4[illegible]	3[illegible]
Do. ... ... Deb.	Stk.	98[illegible]—94[illegible]	5	6[illegible]	96 98	80
Beardmore (W.) ... ... Deb.	100	96[illegible]—91[illegible]	4[illegible]	5[illegible]	94 96	89
Brown (John) ... ... Ord.	1 (15s. pd.)	23 —17 9	12[illegible]	9[illegible]	[illegible]—[illegible]xd	[illegible]
Do. ... ... Cum. pref.	10	10[illegible]—9[illegible]	5	5[illegible]	9[illegible]—10xd	8[illegible]
Cammell Laird ... ... Ord.	5	3[illegible]—27	7[illegible]	7[illegible]	3[illegible] -4[illegible]	[illegible]
Do. ... ... Cum. pref.	5	92/6—79/-	5	6[illegible]	4[illegible] -4[illegible]	3[illegible]
Do. ... ... Deb.	100	90[illegible]—84[illegible]	4[illegible]	5	92—94	90
Dunlop (Jas.) ... ... Ord.	1	18/6—17/6	Nil.	—	[illegible]—[illegible]	[illegible]
Do. ... ... Cum. pref.	1	1[illegible] [illegible]	6	7[illegible]	[illegible] 1	[illegible]
Fairfield Shipbldg Cum. pref.	10	10—7[illegible]	6	8[illegible]	— —	7[illegible]
Fleming & Ferguson ... Ord.	10	20 -12[illegible]	10	6[illegible]	14[illegible]—14[illegible]	14[illegible]
Gray (Wm.) ... ... Deb.	100	100[illegible]—100	4[illegible]	4[illegible]	100-102	100
Henderson (D. & W.) Cum. pref.	1	[illegible]—[illegible]	5	12	[illegible]—[illegible]	[illegible]
Richardsons Westgarth Ord.	1	3/6—1/9	Nil.	Nil.	[illegible]—[illegible]	[illegible]
Do. ... ... Cum. pref.	1	9 9 4 3	Nil.	Nil.	[illegible] [illegible]	[illegible]
Do. ... ... Deb.	Stk.	70—58	4[illegible]	6[illegible]	55 55	69[illegible]
Simons (W.) ... Cum. pref.	10	10[illegible]—10	5	4[illegible]	10[illegible]—10[illegible]	10[illegible]
Stephenson (R.) ... ... Ord.	1	66[illegible] 53	Nil.	Nil.	—	-
Do. ... ... Deb.	Stk.	66[illegible]—63	Nil.	Nil.		
Swan, Hunter & W. R. ... Ord.	1	19 10[illegible]-16 -	1[illegible]0	10[illegible]	[illegible] 1	1[illegible]
Do. ... ... Cum. pref.	1	19 9 17 9	5	[illegible]	[illegible] 1	[illegible]
Do. ... ... Deb.	Stk.	90[illegible]—88	4[illegible]	4[illegible]	90 93	90 - 93
Thornycroft (John I.) ... Ord.	1	27 6 12 6	8	8	[illegible] [illegible]	[illegible]
Do. ... ... Cum. pref	1	19 3—11/3	6	7[illegible]	[illegible] [illegible]	[illegible]
Do. ... ... Deb.	100	94—91	5	5[illegible]	88 92	93[illegible]
Wallsend Slipway ... Ord.	1	1[illegible]—1[illegible]	10	—	1[illegible] -[illegible]	-
Do. ... ... Cum. pref.	1	20/—20/-	5	—	[illegible]—[illegible]	-

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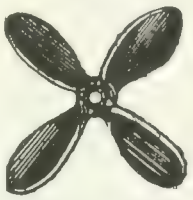

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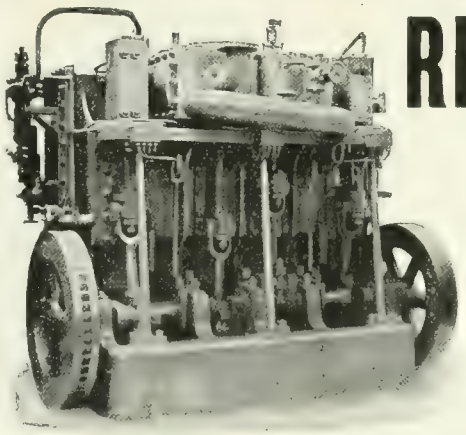

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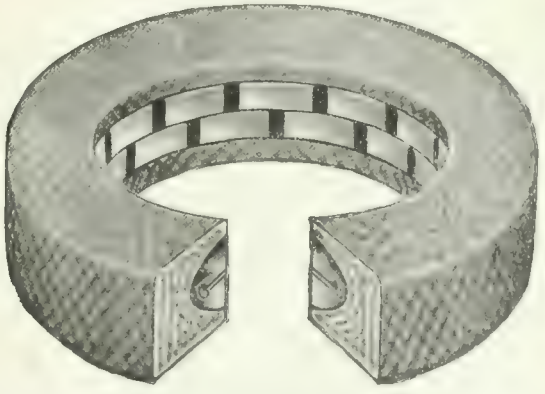

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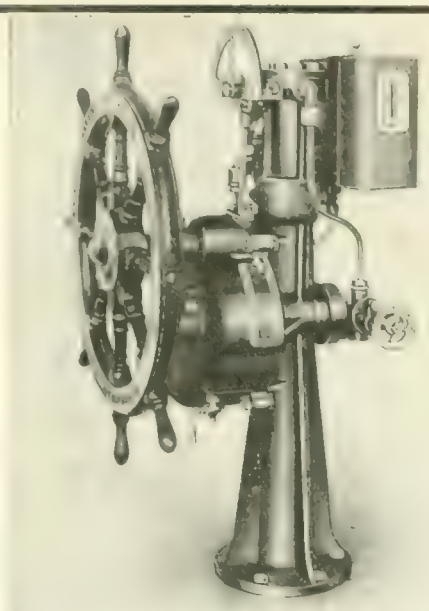

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Chadburns (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.
CONDENSERS—
Belliss & Morcom, Ltd., Birmingham.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Dawson & Downie, Elgin Works, Clydebank.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Royles, Ltd., Irlam, Nr. Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.
CONDENSER TUBES (Brass and Copper)—
Yorkshire Copper Works, Ltd., Leeds.
CONTROLLERS & CONTROL GEAR—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-
Reyrolle, A., & Co., Ltd., Hebburn-on-Tyne.
CONVEYORS—
Mather & Platt, Ltd., Manchester.
COOKING APPARATUS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Grieve, T., & Sons, Bedford Street, North Shields.
COPPER PIPES—
Yorkshire Copper Works, Ltd., Leeds.
COPPERSMITHS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Chambers, John, Ltd., Lowestoft.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Royles Ltd., Irlam, Nr. Manchester.
COPPER TUBES—
Yorkshire Copper Works, Ltd., Leeds.
CORK INSULATION—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W. [Newcastle-on-Tyne.
Newalls Insulation Co., 31, Mosley Street,
CORRUGATED IRON—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
COUNTER (Engine)—
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.
CRAB WINCHES—
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.
CRANES—
Ransomes & Rapier, Ltd., 32, Victoria St., S.W.
Stothert & Pitt, Ltd., Bath.
CYLINDERS (Copper)—
Yorkshire Copper Works, Ltd., Leeds.
DELTA METAL—
Delta Metal Co., Delta Works, East Greenwich, S.E.
DERRICKS & DAVITS—
Howden, James, & Co., Ltd., 95, Scotland Street, Glasgow.
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.
DISTILLING APPARATUS—
Royles Ltd., Irlam, Nr. Manchester.
DIVING APPARATUS—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, S.E.
Mining Engineering Co., Ltd., Meco Works, Moorfields, Sheffield.
DOCK & SHIP LIGHTING—
Carbic Ltd., 51, Holborn Viaduct, London, E.C.
DOCK GATES—
Chalmers, Wm., & Co., Ltd., Rutherglen, Nr. Glasgow.
Hamilton, Wm., & Co., Ltd., Port Glasgow, Scotland.
Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne.
DOORS (Watertight)—
British Thomson-Houston Co., Ltd., Rugby.
Stone, J., & Co., Ltd., Deptford, S.E.

BUYERS' GUIDE—*continued.*

DREDGE PLANTS—
[illegible] [Glasgow

DREDGING
[illegible] Dredging Co., Ltd., Queen [illegible] Westminster, London, S.W.

DRILLING MACHINES—
[illegible] Ltd., Dublin Foundry

DRILLS—
Chatwin, Thos., Ltd., Gt. Tindal St., Birmingham.

DRILLS (Pneumatic and Electric)—
[illegible]

DRY FITTINGS (Laundry)—
[illegible]

DYNAMOS
[illegible] Ltd. Queen [illegible]
[illegible]
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.

ELECTRIC CRANES—
[illegible] Works, Leeds.
[illegible]
Ransomes & Rapier, Ltd., 23, Victoria Street, London, S.W.
[illegible]

ELECTRIC DERRICKS—
[illegible] Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., [illegible]

ELECTRIC DYNAMOS & MOTORS—
[illegible] Ltd., Liverpool.
[illegible] Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., [illegible]
[illegible] Works, Leeds.
Holmes, J. H., & Co., Portland Road, Newcastle-
Mather & Platt, Ltd., Manchester. on-Tyne.
[illegible] Ltd., Sunderland.

ELECTRIC FITTINGS—
[illegible] & Co., Commercial Rd., Sheffield.

ELECTRIC HEATING & COOKING APPARATUS
[illegible] Co., Ltd., Rugby.
[illegible] West Campbell

ELECTRIC LAMPS—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., [illegible]
[illegible] West Campbell

ELECTRIC LIGHTING—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., [illegible] [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRIC-LIGHTING PLANT—
British Thomson-Houston Co., Ltd., Rugby.
[illegible] Ltd.,
Greenwood & Batley, Ltd., Albion Works, Leeds.
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., [illegible]

ELECTRIC MOTORS—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRIC WIRES—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.

ELECTRICAL CONTRACTORS—
Holmes, J. H., & Co., Portland Road, Newcastle-on-Tyne.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow. [Glasgow.
Martin, W. C., & Co., 10, West Campbell Street, Mather & Platt, Ltd., Manchester.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRICAL ENGINEERS—
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Chadburn's (Ship) Telegraph Co., Ltd., Cyprus Road, Bootle, Lancs.
Graham, Alfred, St. Andrew's Works, Crofton Park Road, S.E.
Holmes, J. H., & Co., Portland Road, Newcastle-
Mather & Platt, Ltd., Manchester. [on-Tyne.
Reyrolle, A., & Co., Ltd., Hebburn-on-Tyne.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

ELECTRICAL INSTRUMENTS (Ammeters)
[illegible] Co., Ltd., Rugby.
[illegible] & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

ELECTRICAL INSTRUMENTS (Circuit Breakers)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-
Reyrolle, A., & Co., Ltd., Hebburn-on-Tyne.

ELECTRICAL INSTRUMENTS (Relays)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-
Reyrolle, A., & Co., Ltd., Hebburn-on-Tyne.

ELECTRICAL INSTRUMENTS (Voltmeters)—
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester. [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-

EMERY WHEELS—
Sterne, L., & Co., Ltd., Crown Iron Works, Glasgow.

ENAMEL MANUFACTURERS—
Holzapfels, Ltd., Newcastle-on-Tyne.
Wailes Dove Bitumastic Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.
Websters Ltd., Hull.

ENGINE (Electric Light)—
Belliss & Morcom, Ltd., Birmingham.
Greenwood & Batley, Ltd., Albion Works, Leeds.

ENGINES (Land)—
Chambers, John, Ltd., Lowestoft.

ENGINES (Marine)—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Central Marine Engine Works, West Hartlepool.
Chambers, John, Ltd., Lowestoft.
Hawthorn, R. & W., Leslie & Co., Ltd., St. Peter's, Newcastle-on-Tyne.
Howden, James, & Co., Ltd., Scotland St., Glasgow.
Perman & Co., Ltd., 82-83, Fenchurch Street, E.C.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

ENGINE & DECK STORES—
McGeoch, Wm. & Co., Ltd., 28, West Campbell Street, Glasgow.
Metallic Valve Co., Colonial House, Water Street, Liverpool.

ENGINE AUXILIARIES—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.

ENGINE FITTINGS—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.
McKobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

ENGINE-ROOM OUTFITS—
Grieve, T., & Sons, Bedford Street, North Shields.
Newalls Insulation Co., 31, Mosley Street, Newcastle-on-Tyne.

ENGRAVERS—
Brown, Robert, & Co., 12, Espedair St., Paisley.

EVAPORATORS—
Central Marine Engine Works, West Hartlepool.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Royles, Ltd., Irlam, Nr. Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.

EXTRUDED METALS (Brass, Bronze, Copper, Delta Metals)—
Delta Metal Co., Ltd., E. Greenwich, London, S.E.

FANS—
Adam, J. M., & Co., Greenfield Iron Works, Dalmarnock, Glasgow.
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Boothroyd, H. T., Ltd., Bootle, Liverpool.
British Thomson-Houston Co., Ltd., Rugby.
British Westinghouse Electric & Mfg., Co., Ltd., Trafford Park, Manchester. [Belfast.
Davidson & Co., Ltd., Sirocco Engineering Works,
Hogan & Wardrop, 2, Gresham Buildings, Basinghall Street, London, E.C.
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

FEED-WATER HEATERS—
Beresford Eng'n'ring Co., Beresford Lane, Cardiff.
Central Marine Engine Works, West Hartlepool.
Richardsons, Westgarth & Co., Ltd., Hartlepool.
Royles, Ltd., Irlam, Nr. Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.

FILES—
Brown, John, & Co., Atlas Works, Sheffield.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

FILTERS (Marine)—
Central Marine Engine Works, West Hartlepool.
Chambers, John, Ltd., Lowestoft.
Cockburns, Ltd., Cardonald, Nr. Glasgow.
Mather & Platt, Ltd., Manchester.

FIREBARS—
Liverpool Patents Co., Ltd., Derby Square, James Street, Liverpool.

FIRE EXTINGUISHERS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Mather & Platt, Ltd., Manchester.

FIRE-FIGHTING APPLIANCES—
Mining Engineering Co., Ltd., Meco Works, Sheffield.

FLAGS—
Riley, Edward, & Co., Leeds.
Speedings, Ltd., Sail Works, Sunderland.

FLOATING DOCKS—
Chalmers, Wm., & Co., Ltd., Rutherglen, Nr. Glasgow. [Scotland.
Hamilton, Wm., & Co., Ltd., Port Glasgow,
Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne.

FLOOR COVERING—
Docker Bros., Ltd., Metropolitan Road, Saltley, Birmingham.

FORCED DRAUGHT—
Adam, J. M., & Co., Greenfield Iron Works, Dalmarnock, Glasgow. [Belfast.
Davidson & Co., Ltd., Sirocco Engineering Works,
Howden, J., & Co., Ltd., Scotland Street, Glasgow.
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

FORGING PRESSES—
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
Mactaggart, Scott & Co., Ltd., Loanhead, Edinburgh.

FORGINGS—
Brown, John & Co., Ltd., Atlas Works, Sheffield.
Darlington Forge Co., Ltd., Darlington.
Hingley & Sons, Ltd., Netherton Iron Works, Staffs.
Sunderland Forge & Engineering Co., Ltd., Sunderland.

FORGINGS (Bronze)—
Delta Metal Co., Delta Works, East Greenwich, London, S.E.

FORGINGS (Steel)—
Brown, John, & Co., Ltd., Atlas Works, Sheffield.
Darlington Forge Co., Ltd., Darlington.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

FUMIGATORS—
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.

FURNACE BRIDGES—
Hamilton, A., & Sons, 13, Bute Crescent, Docks, Cardiff.
McConwell, A., & Co., Ltd., 60, Drury Buildings, Water Street, Liverpool.

FURNACES—
Brown, John, & Co., Ltd., Atlas Works, Sheffield.
Deighton's Patent Flue & Tube Co., Ltd., Vulcan Works, Pepper Road, Leeds.
Leeds Forge Co., Ltd., Leeds.
Piggott, T., & Co., Ltd., Birmingham.

FUSES—
Reyrolle, A., & Co., Ltd., Hebburn-on-Tyne.

GALLEY GEAR—
Grieve, T., & Sons, Bedford Street North Shields.

GALVANIZERS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

GAS ENGINES—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Mather & Platt, Ltd., Manchester.

GAUGES—
Chatwin, Thos., Ltd., Gt. Tindal St., Birmingham.

GEAR CUTTING—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

GEARING—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds

GEARS—
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

GEARS (Noiseless or Silent)—
British Thomson-Houston Co., Ltd., Rugby.
Brown, David, & Sons (Hfd.), Ltd., Huddersfield.

GOVERNORS—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.

GRINDING MACHINES—
Greenwood & Batley, Ltd., Albion Works, Leeds.

GRINDING WHEEL MACHINES—
Sterne, L., & Co., Ltd., Crown Iron Works, Glasgow

HATCH COVERS (Patent)—
Hogg-Carr Construction Co., Ltd., Newcastle-on-Tyne.

HEATING APPARATUS—
Ashwell & Nesbit, Ltd., Barkby Lane, Leicester.
Royles, Ltd., Irlam, Nr. Manchester.
Saunders & Taylor, Ltd., 43, Lower Mosley Street, Manchester.

HEATING ENGINEERS—
Ashwell & Nesbit, Ltd., Barkby Lane, Leicester.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
Royles, Ltd., Irlam, Nr. Manchester.
Saunders & Taylor, Ltd., 43, Lower Mosley Street, Manchester.

HELM SIGNAL TELEMOTORS—
Mactaggart, Scott & Co., Ltd., Loanhead, Edinburgh.

HIGH SPEED DRILLS—
Brown, John, & Co., Atlas Works, Sheffield.

HIGH SPEED STEEL—
Brown, John, & Co., Atlas Works, Sheffield.

HOISTS—
Mather & Platt, Ltd., Manchester.
Stothert & Pitt, Ltd., Bath.
Waygood-Otis, Ltd., Falmouth Road, S.E.

BUYERS' GUIDE—*continued.*

HOSE—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London, S.E.

HYDRAULIC CRANES—
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
Brown Brothers & Co., Ltd., Rosebank Iron Works, Edinburgh.
Mactaggart, Scott & Co., Ld., Loanhead, Edinburgh

HYDRAULIC MACHINERY—
Armstrong, Sir W. G., Whitworth & Co., Ltd., Elswick Works, Newcastle-upon-Tyne.
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
Waygood-Otis, Ltd., Falmouth Road, S.E.

HYDRANTS—
McRobie, John, & Sons, 94, Elliott Street, Cranstonhill, Glasgow.

INDIARUBBER—
Heinke, C. E., & Co., 88, 89, Grange Road, Bermondsey, London S.E.

INDICATORS—
Robinson, A., & Co., Ltd., Bootle, Liverpool.

INDUCED DRAUGHT—
Davidson & Co., Ld., Sirocco Eng'n'g W'rks, Belfast
Keith, James, & Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

INSULATIONS—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W. [Liverpool.
Liverpool Refrigeration Co., Ltd., Colonial House,

IRON ROOFS AND BUILDINGS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.

JOINTING MATERIAL (Manganesite)—
Hudson & Co.'s Successors, John, 15, Victoria Warehouses, Mansell Street, E.C.

LAMPS AND LIGHTS—
Grieve, T., & Sons, Bedford Street, North Shields.
Kaye, Joseph, & Sons, Ltd., Leeds.

LAUNCHES—
Chambers, John, Ltd., Lowestoft.
Crichton, J., & Co., Saltney Shipyard, Chester.
Leitch, John, & Co., The Ferry, Renfrew, Scotland.
Livingstone & Cooper, Ltd., Hessle, Hull.
MacLaren Bros., Ltd., Dumbarton.
Perman & Co., Ltd., 82-83, Fenchurch St., E.C.
Seamless Steel Boat Co., Ltd., Wakefield.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, London, S.W.
Watson, J. S., Gainsborough.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

LAUNDRY MACHINERY—
Bradford, T., & Co., Salford, Manchester.

LAVATORY FITTINGS AND APPLIANCES—
Levick, John, Alma Street, Aston, Birmingham.

LEAD (Sheets and Pipes)—
Rimer Bros., Newcastle-on-Tyne.

LEAD (White and Red)—
Rimer Bros., Newcastle-on-Tyne.

LIFEBELTS AND BUOYS—
Speedings Ltd., Sail Works, Sunderland.

LIFTS (Window)—
Laycock, W. S., Ltd., Victoria Works, Millhouses, Sheffield.

LIFTS AND HOISTS—
Mactaggart, Scott & Co., Ld., Loanhead, Edinburgh
Waygood-Otis, Ltd., Falmouth Road, S.E.

LIGHTERAGE—
Alexander, W. H. J., St. John's Wharf, Wapping, E.

LIGHTERS—
Chalmers, Wm., & Co., Ltd., Rutherglen, Nr. Glasgow.
Crichton, J., & Co., Saltney Shipyard, Chester.
Watson, J. S., Gainsborough.

LIMEWASHING & DISINFECTING MACHINES—
Stonehouse Work Co., Ltd., Houghton Street, West Bromwich.

LOCKS—
Kaye, Joseph, & Sons, Ltd., Leeds.

LOCOMOTIVE TUBES (Copper & Brass)—
Yorkshire Copper Works, Ltd., Leeds.

LUBRICATORS— [Cranstonhill, Glasgow.
McRobie, John, & Sons, 94, Elliott Street,

MACHINE TOOLS—
Campbells & Hunter, Ld., Dolphin Foundry, Leeds.
Greenwood & Batley, Ltd., Albion Works, Leeds.
Scriven & Co., Leeds Old Foundry, Leeds.

MACHINERY NAME PLATES—
Brown, Robert, & Co., 12, Espedair St., Paisley.

MAGNESIA—
Jones, Fredk., & Co., Ltd., Perren Street, Kentish Town, N.W.

MARINE ENGINEERS—
Bailey, C. H., Newport, Mon. Barry Docks.
Barry Graving Dock & Engineering Co., Ltd.,
Brown, John, & Co., Ltd., Clydebank, Nr. Glasgow.
Chambers, John, Ltd., Lowestoft.
Crichton, C. & H., Ltd., Huskisson Engine Works, Liverpool. [Southampton.
Day, Summers & Co., Ltd., Northam Ironworks,
Delegación de la Compañia Trasatlantica, Cadiz.
Diamond, Thos., & Co., Cardiff.
Doxford, Wm., & Sons, Ltd., Sunderland.
Elliott & Jeffery, East Dock, Cardiff.
Gray, Wm., & Co., Ltd., West Hartlepool.
Harland & Wolff, Ltd., Belfast.
Harris Bros., Ltd., Cambrian Dry Docks, Swansea.
Hawthorn, R. & W., Leslie & Co., Ltd., Hebburn-on-Tyne.
Hill's Dry Docks & Engineering Co., Ltd., Cardiff.

MARINE ENGINEERS *(contd).*—
Livingstone & Cooper, Ltd., Hessle, Hull.
Mountstuart Dry Docks, Ltd., Cardiff.
Perman & Co., Ltd., 82-83, Fenchurch St., E.C.
Richardsons, Westgarth & Co., Ltd., Hartlepool, Middlesbrough and Sunderland.
Shearman, John, & Co., Ltd., Cardiff.
Simons, Wm., & Co., Ltd., Renfrew, Nr. Scotland.
Stephen, Alex., & Sons, Ltd., Linthouse, Govan, Glasgow.
Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne. [Westminster, S.W.
Thornycroft, John I., & Co., Ltd., Caxton House,
Wallsend Slipway & Engineering Co., Ltd., Wallsend-on-Tyne.
White, J. Samuel, & Co., Ltd, East Cowes, I.W.
Workman Clark & Co., Ltd., Belfast.
Yarrow & Co., Ltd., Glasgow.

MARINE GOVERNORS—
Aspinall's Patent Governor Co., 7, Strand Street, Liverpool.

MARKING-OFF TABLES—
Campbells & Hunter, Ltd., Dolphin Foundry, Leeds.

MATTRESSES—
Stewart, Archibald, & Co., 40-48, Union St., Glasgow

METALLIC PACKING—
Beldam Packing & Rubber Co., Ltd., 1 and 2, Gracechurch Street, London, E.C.
McConnell, A., & Co., Ltd., 60, Drury Buildings, Water Street, Liverpool
United States Metallic Packing Co., Ltd., Bradford

METAL SPINNINGS—
Levick, John, Alma Street, Aston, Birmingham.

METALS (Patent)—
Bowran, Robt., & Co., Ltd., Newcastle-on-Tyne.
Delta Metal Co., Ltd., Delta Works, East Greenwich.

MOTOR BOATS—
Chambers, John, Ltd., Lowestoft.
Crichton, J., & Co., Saltney Shipyard, Chester.
Leitch, John, & Co., The Ferry, Renfrew, Scotland.
Livingstone & Cooper, Ltd., Hessle, Hull.
MacLaren Bros., Ltd., Dumbarton.
Perman & Co., Ltd., 82-83, Fenchurch St., E.C.
Seamless Steel Boat Co., Ltd., Wakefield.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, London, S.W.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

MOTOR STARTING AND CONTROL GEAR— [on-Tyne.
Holmes, J. H., & Co., Portland Road, Newcastle-
Reyrolle, A., & Co., Ltd., Hebburn-on-Tyne.

NAVAL ARCHITECTS' SUPPLIES—
Walker, Jas., & Co., 11, Bishop Court, Anderston, Glasgow.

OIL CANS—
Kaye, Joseph, & Sons, Ltd., Leeds.

OIL ECONOMISERS—
Kaye, Joseph, & Sons, Ltd., Leeds.

OIL ENGINES—
British Westinghouse Electric & Mfg. Co., Ltd., Trafford Park, Manchester.
Edina Manufacturing Co., 19b, Broad Wynd, Leith.
Perman & Co., Ltd., 82-83, Fenchurch Street, E.C.
Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne.
Thornycroft, John I., & Co., Ltd., Caxton House, Westminster, S.W.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

OIL-FUEL INSTALLATION—
Wallsend Slipway & Engineering Co., Ltd., Wallsend-on-Tyne.
White, J. Samuel, & Co., Ltd., East Cowes, I.W.

OIL IMPORTERS & BLENDERS—
Rimer Bros., Newcastle-on-Tyne.

PACKING (Engine)—
Beldam Packing & Rubber Co., Ltd., 1 and 2, Gracechurch Street, London, E.C.
Walker, Jas., & Co., Ltd., Lion Works, Garford Street, West India Dock Road, E.

PAINTS—
Briggs, W., & Sons, Ltd., Dundee.
Cocks, Harry, & Co., Cardiff.
Hamilton, Archd., & Co., Possilpark, Glasgow.
Hoyle, Robson, Barnett, & Co., Ltd., St. Nicholas Chambers, Newcastle-on-Tyne.
Wailes Dove Bitumastic Ltd., 5, St. Nicholas Buildings, Newcastle-on-Tyne.
Websters Ltd., Hull.

PANELLING—
Stewart, Archibald, & Co., 40-48, Union St., Glasgow

PATENT HAWSE PIPE AND DECK FLANGE—
Hamilton, A., & Sons, 13, Bute Crescent, Docks, Cardiff.

PERFORATED METALS—
Braby, F., & Co., Ltd., Eclipse Works, Glasgow.
Piggott, T., & Co., Ltd., Birmingham.

PIPES—
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.
Yorkshire Copper Works, Ltd., Leeds.

PLANING MACHINES for Plate Edges—
Scriven & Co., Leeds Old Foundry, Leeds.

PLATE BENDING ROLLS—
Scriven & Co., Leeds Old Foundry, Leeds.

PORCELAIN ENAMELLED CAST IRON—
Levick, John, Alma Street, Aston, Birmingham.

PROPELLERS—
Billington & Newton, Ltd., Longport, Staffs.
Chambers, John, Ltd., Lowestoft. [Liverpool.
Crichton, C. & H., Ltd., Huskisson Engine Works.
Darlington Forge Co., Ltd., Darlington.
Spencer, John, & Sons, Ltd., Newburn-on-Tyne.

PROPELLER BLADES—
Billington & Newton, Ltd., Longport, Staffs.
Darlington Forge Co., Ltd., Darlington.
Stewarts & Lloyds, Ltd., 41, Oswald St., Glasgow.

PUBLICATIONS—
"Shipbuilding and Shipping Record, Queen Anne's Chambers, Westminster, London, S.W.

PULLEY BLOCKS—
Bullivant & Co., Ltd., 72, Mark Lane, London, E.C.
Higginson & Co., 7, Hurst Street, Liverpool.
Loveridge, Ltd., Cardiff.
Wright, Joseph, & Co., Ltd., Tipton, Staffs.

PUMPS—
Allen, W. H., Son & Co., Ltd., Queen's Engineering Works, Bedford.
Beresford Eng'n'ring Co., Beresford Lane, Cardiff.
Berry, Henry, & Co., Ltd., Croydon Works, Leeds.
Central Marine Engine Works, West Hartlepool.
Davey & Co. (London), Ltd., 88, West India Dock Road, E.
Dawson & Downie, Elgin Works, Clydebank.
Edina Manufacturing Co., 19h, Broad Wynd, Leith.
Hall, J. P., & Sons, Ltd., Peterborough.
Mather & Platt, Ltd., Manchester.
Weir, G. & J., Ltd., Cathcart, Glasgow.

PUNCHING AND SHEARING MACHINES—
Scriven & Co., Leeds Old Foundry, Leeds.

RADIATORS—
British Thomson-Houston Co., Ltd., Rugby.
Low, Archibald, & Sons, Ltd., 78, Merkland Street, Partick, Glasgow.
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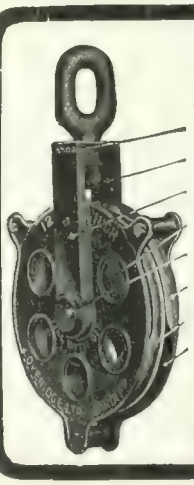

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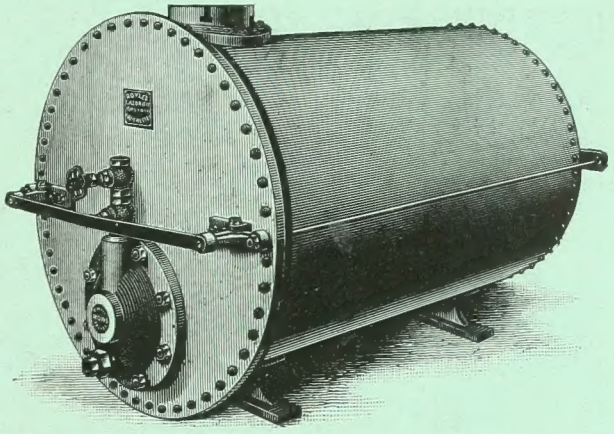

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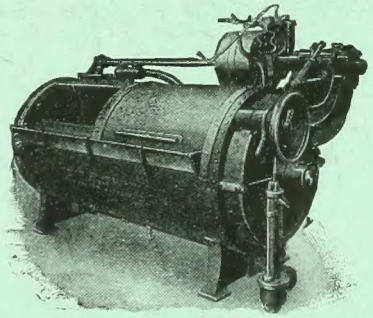

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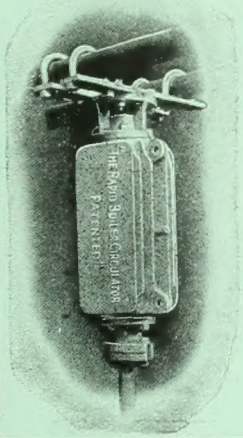

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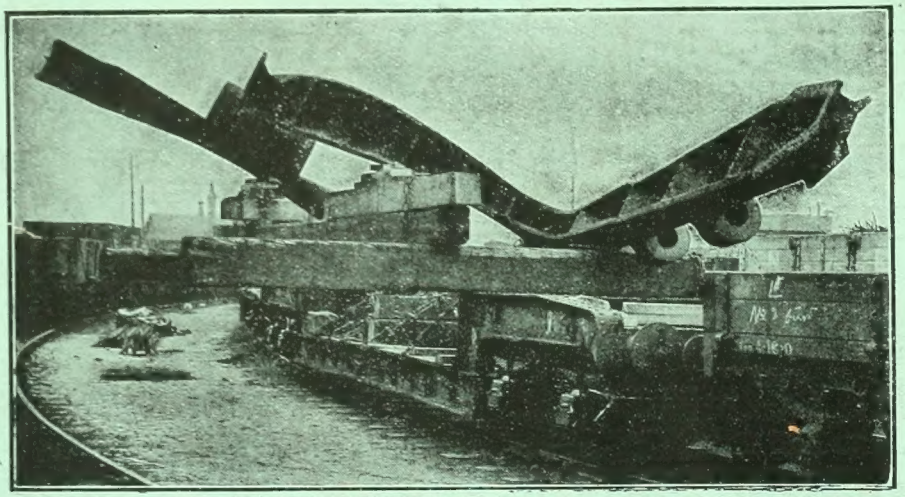

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